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DIVERSIFICATION DISCOUNT IN U.S. BANKS

Master's Thesis
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Abstract

This paper examines whether diversity of activities among banks affects their market valuations and how this effect on value varies in time, especially during the financial crisis of 2007 to 2009 and its aftermath. I find evidence that diversified banks that participate in multiple activities are valued lower by the market than if those banks were broken into financial institutions that specialize solely in one activity. The effect of diversity of activities on value is separated from several other effects that could induce an effect on the value of the banks. I also find that the level of the observed diversification discount has decreased significantly throughout the sample period of 2006 to 2016. The underlying reasons for these findings remain opaque, but they suggest that the diversified banks' economies of scope and benefits of having internal capital markets are not enough to counter the resulting drawbacks due to agency problems and inefficient capital allocation.

Keywords Diversification discount, financial conglomerate, financial crisis, bank

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Tässä tutkimuksessa tarkastellaan, vaikuttaako finanssikonglomeraattien monialaisuus niiden markkina-arvoon ja miten tämä vaikutus arvoon vaihtelee ajassa, etenkin 2007-2009 finanssikriisin aikaan ja sen jälkimainingeissa. Löydän todisteita siitä, että markkinat arvottavat monia eri toimintoja yhdistelevät monialapankit alemmin, kuin jos nämä pankit purettaisiin osiin, jotka ovat erikoistuneet vain yhteen toimintaan. Toiminnan monimuotoisuuden vaikutus arvoon erotetaan useista muista vaikutuksista, jotka voivat vaikuttaa pankkien arvoon. Havaitsen myös, että havaitun diversifikaatioalennuksen taso on laskenut merkittävästi otannan aikaperiodin aikana vuosien 2006 ja 2016 välillä. Näiden havaintojen taustalla olevat syyt ovat edelleen epäselviä, mutta ne viittaavat siihen, että monialapankin synergiaedut ja sisäisen pääomamarkkinan hyödyt eivät ole vielä tarpeeksi suuria agenttiongelmien ja epätehokkaan pääoma-allokaation aikaansaamien haittojen ylittämiseksi.

Avainsanat Diversifikaatioalennus, finanssikonglomeraatti, finanssikriisi, pankki

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1. Introduction

Corporate diversification is making a comeback. In the academia, the widespread view that corporate diversification homogenously destroys value and leads to a *diversification discount* has recently shifted and taken a more positive, yet multifaceted, tone. Firms, on the other hand, are very active in increasing their diversity of activities[1]. Martynova and Renneboog (2008) study M&A activity over several decades and find the number of M&A deals is nowadays much higher than ever before. Year 2015 marked a new record for global M&A with total volume surpassing $5.0tr, of which a significant portion has the effect of increasing the diversity of firm activities[2].

One of the core ideas in economics is that specializing in certain activities is beneficial. However, theoretically speaking, increased diversity of activities could result in both positive and negative effects to firm value. Efficient internal capital markets and debt coinsurance effect may create value for a conglomerate by enabling optimal resource allocation and by decreasing the volatility of firm cash flows. On the flipside, inefficient internal capital markets entail poor capital allocation process in which value is destroyed. Similarly, increased diversification may also lead to increased agency issues and conflicts of interest between the firm insiders and stakeholders.

The opinions of the net effect of diversification on value has seen large fluctuations during the past five decades. During the great merger wave of the 1960s the common view was that diversification of activities was beneficial, whereas in the 1980s and 1990s firms started to focus on their core activities and diversification lost its status as something to pursue. The 1990s view also coined the term *'diversification discount'* which in its simple form posits that diversified firms have on average lower valuations that comparable specialized firms do. The main academic findings in this era strongly suggest that this indeed the case[3]. However, even

[1] See for example Elsas, Hackethal, and Holzhäuser (2010) descriptive statistics on the trend of increasing diversity among U.S. and European banks.

[2] Dealogic M&A Review Full Year 2015 Final Results, published January 2016.

[3] Evidence pointing towards a diversification discount is provided by for example: Lang and Stulz (1994), Berger and Ofek (1995), Comment and Jarrell (1995), Daley et al. (1997), Denis et al. (1997), Lamont (1997), Scharfstein (1998), Desai and Jain (1999), Berger and Ofek (1999), Lins and Servaes (1999), Rajan et al. (2000), Morgan et al. (2000), Lins and Servaes (2002).

the findings in the 1990s did not uniformly support the diversification discount, which is a fact that provided the suitable background for the new academic view on corporate diversification to emerge. The concurrent researchers have criticized the methods and final conclusions of the older analyses and currently, there seems to be no consensus about diversification's effect on value. Rather, the effect is acknowledged to be heterogenous between industries and seems to be more positive in the presence of high external financial constraints.

Contemporary research on diversification discount has concentrated on finding insights on how the discount materializes and under which situations it is likely to flourish. There have been numerous studies on different types of firms and industries with differing focal points. In their international sample, Laeven and Levine (2007) find a diversification discount in financial conglomerates and argue that the plausible benefits of conglomeration are not enough to counter the costs[4]. Kuppuswamy and Villalonga (2016) study the time variation of the discount with non-financial corporations and find the discount to completely disappear at the height of the 2007-2009 financial crisis. The authors argue there is significant insurance value in corporate diversification.

I argue that it is possible that the financial crisis has reset the relationship between diversity and value, especially in the banking industry. Laeven and Levine (2007) and Baele et al. (2007) find a significant valuation premium in investment banking. These banks were however, those that were among the hardest hit when the financial crisis hit with full force in late 2008[5]. Simultaneously, commercial banks that pursued mainly lending activities and had long-term receivables, faced the crisis with more resilience. Hence, diversification's effect on value could differ after-crisis from the pre-crisis era; diversified banks could benefit from better shock-absorption capabilities, but also suffer from the more pessimistic outlook for their investment banking segments. In other words, the direction of the diversification's effect on value after the crisis may not be what it used to be and hence calls for more research.

In this paper, I investigate the presence of a diversification discount among financial conglomerates (from hereafter "banks"). Specifically, the key issue here is to explore the time variance of the discount within this segment especially during the global financial crisis of

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[4] Other studies find the U.S. evidence to be similar (Schmid and Walter (2009)), but it seems that diversification may have a positive impact on value in Europe (Baele et al. (2007), Elsas et al. (2010)).

[5] Often, when reviewing financial firm diversification, the researchers look at the split between commercial and investment banking activities as a proxy for diversity. Looking at the sample I use, Tobin's q (market-to-sales) dropped by 31% (41%) for investment banks and 6% (28%) for commercial banks.

2007-2009 and its aftermath. To the best of my knowledge, this topic has not been studied before. In addition to providing new insights into diversification discount, this line of study is important in several other respects. Firstly, if diversified banks are valued differently from focused banks, and this differential is somehow related to the riskiness of the bank, it has direct effects on optimal bank regulation in terms of deciding what is the optimal size of a bank for the stability of the system. Second, the valuation considerations are naturally important for the prospective or current bank shareholders and for the boards and management of the banks that make the diversification decisions. Third motivator for this study is the rapid diversification of bank activities in the United States and elsewhere. Since 1999 U.S. based banks have been allowed to mix investment and commercial banking activities i.e. have only since then fully permitted to diversify. Removing this obstacle has certainly made them larger and more diversified. The trend of more diversification is evident also in the sample used in this study. But the question remains, should the banks pursue diversity instead of focus?

By using a quarterly sample from 2006 to 2016 with 405 banks and 15,936 bank-quarter observations, I find evidence that diversified banks that participate in multiple activities are valued lower by the market than if those banks were broken into financial institutions that specialize solely in one activity. The effect of diversity of activities on value is separated from several other effects that could induce an effect on the value of the banks. To improve the robustness of the results, I utilize several metrics of diversity, model specifications and methods. In addition to finding an average diversification discount, I find significant time variation in its mean. The variation illustrates that the market has begun to view diversification more positively than before the financial crisis of 2007-2009 resulting in a significant decline in the level of the discount. There are several possible explanations for these findings which are discussed in Sections 2.1 and 5.1.

I offer contributions to the existing literature on two fronts. For one, I contribute to the wide corporate diversification discount literature by providing more evidence in support of the view that there is a diversification discount in an important sub-segment of firms; among financial conglomerates. Secondly, I contribute to the rather recent strand of literature which focuses on the time variation of the discount and on the factors that seem to affect that variation. In this regard, my contribution is the finding that diversity of activities has become much less value destructive. To the best of my knowledge, there is no prior study that examines this variation among financial institutions.

This paper is organized as follows. Section 2 presents the theories of diversification, the most important empirical findings and summarizes some key elements of bank regulation. Section 3, describes the data and methodology. Section 4 focuses on exhibiting the main empirical result. Section 5 discusses the results and their main limitations. Section 6 concludes.

2. Literature review

In this section, I introduce the academic literature on diversification discount. The literature is large in volume, diverse in scope and, on average, relatively old. Thus, I focus on the more recent collection of studies whilst also glancing at selected older papers which are relevant to the topic of this paper. I largely omit the business strategy and geographic diversification literature because of their irrelevance in this context[6]. This literature review first analyses different theories about diversification; namely why firms choose to diversify in the first place and what possible effects it could have on shareholder value. The theoretical section is followed by survey of empirical findings on diversification's effect on corporate value. I first provide the theoretical and empirical background for all firms and then extend the survey to financial firms which are the theme of this study.

Before detailing the theories, it is worth noting that since the turn of the 21th century the general view and the empirical findings on corporate diversification's value effect have shifted. The predominant view used to be that corporate diversification destroys value. Presently, there is no consensus among academics about the causality of this relationship, but it seems diversification's effect on firm value is heterogenous between industries and is affected by prevailing economic environments.

2.1. Theories on corporate diversification

The traditional Modigliani and Miller (1958) argument is that diversification should have no effect on firm valuation. Equity investors always have the option to diversify within their own portfolios instead of the firm doing it for them by combining business segments. Nevertheless, the argument does not explain why many firms choose to operate in multiple industries and why they participate in the M&A market to the extent that they do.

Numerous theories have been developed over the years, which all tell us a different story about corporate diversification and about its effect on value. Most of these theories follow intuition and it is likely that each one of them captures a portion of the underlying reality. As summarized by Erdorf et al. (2013) in their survey of corporate diversification literature, the

[6] Additionally, I limit the scope of the discussion about the methodological biases in earlier studies. Extensive discussion especially about the problems related to the use SIC codes and COMPUSTAT database is available in Martin and Sayrak (2003).

most prevalent of these theories are: a) *agency theory*, b) *the debt co-insurance effect*, c) *theory of internal capital markets* d) *corporate refocusing theory* and e) *value-maximizing models*.

Additional motives to diversify, which are intuitive but have not been empirically tested are market power and economies of scope. All these theories also view the theme of diversification discount somewhat differently; for the early researchers, the average difference in values between focused and diversified firms was the focal point in research, whereas the modern studies pursue to study the causal linkage between diversification and value.

A. Agency theory

The viewpoint of agency theory is that managers have the incentive to diversify because it maximizes their own personal benefits which, unfortunately, is often accomplished at the expense of the shareholder. These adverse effects of diversification are due to increased job security (Amihud and Lev (1981), increased prestige and power (Jensen (1986)), increased compensation (Jensen and Murphy (1990)) and increased ability for entrenchment (Shleifer and Vishny (1990)). Due to these reasons and more, the management is incentivized to grow the size of the firm above optimal by making investments that do not necessarily have positive NPVs. This theory suggests an inverse relationship between corporate diversification and shareholder value.

Gomes and Livdan (2004) criticise the agency theory by noting that it largely fails to answer the question of why firms choose to diversify and secondly that the related models are difficult to test empirically.

B. Debt co-insurance effect

Lewellen (1971) proposes a simple, yet potentially strong, financial effect from diversification. When a firm has two or more segments which produce cash flows that are less than perfectly correlated, the volatility of cash flows is less than with only one segment. This decreases the overall risk of investing for debt holders and hence increases firm's debt capacity. Increased debt capacity in turn has the potential to increase firm value through the benefits of increased tax shield. Intuitively, lower volatility of cash flows may also lead to higher credit ratings, lower WACC and hence higher share price.

C. Theory of internal capital markets

All conglomerates have some form of internal capital markets which enables financing of investments by utilizing other segments' assets and cash flows. The resulting benefits may be the most important motive for firm diversification.

Firstly, equity capital raised within a firm is likely to be much cheaper than in the external capital markets with their higher transaction and information asymmetry costs. In addition, having more sources for funding creates financial flexibility which may be especially valuable during the presence of external financing constraints. However, internal capital markets may be either efficient or inefficient depending on whether the raised capital flows into positive NPV investments or, alternatively, negative NPV investments which are characterized by increased agency problems.

Both views of the theory have their proponents. Starting from the efficient internal capital markets, Stein (1997) hypothesises that CEOs insider information may help them to choose winners from all the segments' potential projects. Gertner et al. (1994) compare internal and external capital markets from an ownership point of view and argue that the firm's ownership of its internal capital market may lead to three outcomes. First, it leads to more monitoring than bank lending due to firm having residual claims over the assets and hence more to gain. Another positive aspect is that it makes the redeployment of poorly performing assets to other segments more efficient. Lastly, on the negative side, internal capital markets may reduce the entrepreneurial incentives of the segment's management[7].

Quite a few articles take a more doubtful view on the value-adding mechanisms of the internal capital market. Rajan et al. (2000) argue that internal power struggles between diversified firm's segments may cause the capital raised from internal capital markets to flow towards inefficient investments. In a similar fashion, Wulf (2009) links internal capital markets with managers' ability to skew investment decisions towards their own ends. In addition, Inderst and Müller (2003) note that although excess liquidity from internal capital markets may help to overcome financial constraints they may also lead to inefficient follow-up investments with poor returns.

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[7] The segment A which has a project that is funded through other segments ' cash flows or assets is not the 'owner' of the project. As a result, segment A's management is more vulnerable to the decisions of the corporate headquarters and may not get all of the rents from their efforts on the project. This reduces the incentives of the management of segment A.

To summarize, the effect of internal capital markets to shareholder value is not uniform but seems to depend whether the resulting funding flows into value-adding investments or not. In either case, however, the internal capital markets provide financing flexibility for the firm.

D. Corporate refocusing theory

The corporate refocusing theory is a set of theories (or findings), that assume firms are more valuable if their segments would be split into separate firms. These theories include: corporate focusing increases analyst coverage and forecast accuracy (Gilson et al. (2001)); corporate spin-offs reduce information asymmetries between the market and the firm (Krishnaswami and Subramaniam (1999)); diversification may destroy value because the corporate headquarters is insulated from financial constraints which leads to overinvestment (Matsusaka and Nanda (2002); market liquidity affects divestments positively and those firms that divest are poor diversifiers to begin with (Schlingemann et al. (2002)).

The theories of corporate refocusing do not clarify what effect diversification ultimately has on value but rather just assume that the average valuation of diversified firms is lower than focused firms. The assumption then serves a basis for studying some certain elements of the observed discount. This view about diversification was the basis for many studies conducted in the 1990s and early 2000s.

E. Value-maximizing models of diversification

The theories developed in the 21st century have put more emphasis on explaining why it could be a value-maximizing strategy to diversify despite the existence of a diversification discount. Consequently, this literature also explains why firms choose to diversify. The models base on the view that diversification may be an optimal strategy ex-ante, but perhaps not ex-post.

Matsusaka (2001) creates a model which formally addresses an intuitive topic; as the industry of a focused firm is on the decline but not yet out, it may be practical to start diversifying acquisitions to see what works, rather than fully committing to a single new venture. He argues that experimenting is vital in the medium-term due to the uncertainty associated with acquiring new businesses. In a similar vein, Gomes and Livdan (2004) model the optimal behaviour of firms and argue firms choose to diversify for two main reasons. Firstly, diversification is based on an *endogenous selection mechanism* which entails

diversification decisions to take place when firm becomes unproductive in its core business. They argue the second reason for diversification is synergies between segments (i.e. economies of scope). Their model hence provides explanations for both: a) why firms diversify and b) why there is a diversification discount on average. In the world of practice, synergies often play a very large role as firms contemplate on participating in M&A activities.

Maksimovic and Phillips (2002) use a neo-classical model to study diversification decisions with the hypothesis that diversifying firms exhibit value-maximizing behaviour and expand until marginal returns are equal across segments. The model predicts that conglomerates invest efficiently with the capital flowing into segments that are growing and have higher productivities. The authors test these hypotheses using plant level data and find evidence of value-maximizing behaviour, rather than subsidization of unproductive segments. Finally, Bernardo and Chowdhry (2002) use real options framework to account for diversification discount. They argue specialized firms have valuable growth options which are exercised after firms become sufficiently diversified. Thus, the value of diversified firms is lower because the options are exercised already to some extent.

The value-maximizing models described above do not predict diversification to destroy value per se. Rather, there are other factors at work such as the life-cycle of the industry which affects the diversification decision and causes the diversification discount[8].

2.2. Empirical findings on diversification discount

The field of empirical research on diversification discount can be roughly grouped by the main approaches of the studies. The main approaches of studying diversification discount are cross-sectional studies, event studies and analyses on the efficiency of internal capital markets. Another possible way to categorize the studies is about how they view the causality of the diversification discount. Viewed this way, a study can be either '*traditional'* if the average value difference is studied or '*modern'* if the causality of diversification and value is investigated.

I divide this section by first looking at the relevant findings of traditional studies followed by a review of the more recent findings.

[8] Other papers that share this view that there exists a diversification discount but diversification is not the cause include: Burch, Nanda, and Narayanan (2000), Zuckerman (1999) and Fluck and Lynch (1999).

A. Traditional cross-sectional studies

In their pioneering and benchmark-setting article "Tobin's q, Corporate Diversification, and Firm Performance" in 1994, Lang and Stulz find a significant diversification discount with data from 1978 to 1990 by using *Tobin's q* as the measure of value. They compare diversified firms with comparable portfolios of focused firms and find that diversified firms have on average significantly lower q's. The authors base their portfolio construction on LeBaron's and Speidell's (1987) "chop-shop" approach, where a segment's q is estimated by the average q of same segment specialized firms. The segment q's are then weighted with segments' share of sales to reach the imputed q of the firm which is then compared to the actual q. Measurement of diversity, which is widely used, centres on the use of SIC codes. A focused firm has only a single SIC coded segment and a firm is considered to be more diversified if it has five SIC segments instead of three.

Berger and Ofek (1995) continue the analysis and introduce the metric of *excess value* which they use instead of Tobin's q as the dependent variable in their main regressions. Although sometimes defined differently, here the excess value refers to the natural logarithm of ratio between firm's total value and its imputed value. The authors confirm the results of Lang and Stulz by finding diversified firms to trade between 13-15 % discount relative to comparable focused firms. Furthermore, the discount is much more pronounced in the case of unrelated diversifiers which is defined by firm having business segments that do not share 2-digit SIC codes. The authors conclude that the diversification's linkage between lower value could be explained by overinvestment and inefficient cross-subsidization in the internal capital markets.

Other researchers have studied the topic with different sample periods, countries and measures of diversification, but the results have been somewhat inconsistent. For example, Lins and Servaes (1999) find evidence of a discount for Japan and the U.K. but not Germany. Klein (2001) finds evidence of a discount in the 1970s but not in the 1960s. Denis et al. (2002) finds both industrial and geographic diversification to be connected negatively with excess values.

Researchers have also studied emerging markets. Khanna and Palepu (2000) in their study of Indian business groups find a premium for the most diversified business groups suggesting that by replicating the functions of missing government institutions, they can add value. Similar findings and views for emerging markets are provided by Fauver et al. (2003)

who argue that low investor protection and undeveloped capital markets may cause corporate diversification to create value. Conversely, Lins and Servaes (2002) & Claessens et al. (1999) find a diversification discount in their studies about the emerging markets.

As a summary, corporate diversification seems to be linked with lower average value in most developed markets. The evidence, however, suggests that the discount may vary with time.

B. Event studies

The principal idea behind the event study method is to compare diversified firm's value with what it would be if it's segments were divested into single-segment firms. These studies are mixed in their findings of diversification's effect on firm value. Findings consistent with a discount are presented by Comment and Jarrell (1995), Daley et al. (1997), Berger and Ofek (1999) and Desai and Jain (1999) who all find positive stock market reaction for refocusing spin-offs and divestitures. Similarly, studies for diversifying acquisitions' negative effects include Morck et al. (1990), Agrawal et al. (1992), Morgan et al. (2000).

On the other hand, findings that document a positive or a neutral stock market reaction to news about diversifying acquisitions include: Schipper and Thompson (1983), Bradley et al. (1988), Matsusaka (1993), Hubbard and Palia (1999), Chevalier (2004) Dos Santos et al. (2008) and Akbulut and Matsusaka (2010).

However, other researchers note that many of these event studies suffer from fundamental limitations. Lang and Stulz (1994) consider the most important of these caveats to be: a) choice of sample period seems to affect results significantly, b) setting a correct performance benchmark is very difficult, c) whilst comparing diversified firms with focused firms the returns need to risk-adjusted and d) ex-ante diversification could be an optimal strategy, although ex-post it may not be[9]. Intuitively, the often-used metric of initial stock market reaction in these studies may be a flawed measure as it may not correctly account for the long-run value that may be generated from the synergies.

[9] Especially this argument is similar in spirit as the fundamental idea behind value-maximizing models of diversification presented in section 2.1.E.

C. Empirical studies of internal capital markets

As the theoretical models of internal capital markets imply, the effect of having an internal capital markets on value depends on their efficiency. Evidence of both inefficient and efficient internal capital markets have been documented in empirical studies.

Several studies suggest that inefficiencies in the internal capital markets are one of the main causes for the discount. Lamont (1997) studies oil firm investments after industry wide shocks and finds that the firms significantly reduce non-oil investments after exogenous shocks to oil-price. This finding supports the idea of inefficient cross-subsidization. Relatedly, Scharfstein (1998) finds that diversified firms invest less (more) in their high-q (low-q) segments than their stand-alone industry peers. Rajan et al. (2000) find evidence of similar relationship. Their evidence indicates that as the level of diversification increases (decreases), firm is less likely to invest in good (bad) growth opportunities.

Contrasting these findings, other researchers find the internal capital markets to offer benefits, at least in certain situations. Khanna and Tice (2001) find a positive relationship between related diversifiers and efficient internal capital markets. The authors argue that diversified firms seem to make better investment decisions. Peyer (2002) finds that those firms with efficient internal capital markets can gain lower-cost access to external capital markets. This finding supports the view that internal capital markets may reduce information asymmetries between investors and managers. In support of this view, Hadlock et al. (1998) find IPOs and SEOs of diversified firms are less costly than those of stand-alone firms. What is more, Maksimovic and Phillips (2002) analyse plant-level data and find efficient resource allocation within diversified firms. Schoar (2002) finds that diversified firms tend to pay higher wages and have similar productivities as focused firms, indicating that higher costs may explain at least part of the observed discount.

Thus, the empirical evidence on the efficiency of internal capital markets seems somewhat mixed. On the one hand, diversified firms seem to invest sub-optimally due to inefficient cross-subsidization, but on the other hand they seem to be more able to overcome financial constraints due to a reduction in agency problems.

2.3. The contemporary critique of earlier studies

Many, if not most, of these findings have been contested in some way in the more recent studies. The general finding of studies covered this far is that diversified firms trade at a discount in relation to stand-alone firms, with some exceptions. This general finding does not however indicate that diversification causes the discount. Hence, a considerable amount of studies has been conducted during the last decade to establish a more robust causal link between diversification and value whilst also correcting other shortcomings of the earlier literature.

I will briefly go through this contemporary view and about the main concerns this modern literature reflects on the older studies[10]. The main issues relate to a) selection bias, b) the flaws in COMPUSTAT database and c) measurement problems. The debate on what is the 'correct' way to study the diversification discount continues to this day.

A. Selection bias

The implicit assumption in most of the traditional diversification discount studies has been that the individual segments of diversified firms share the comparable focused firms' investment prospects and capabilities. However, Hyland and Diltz (2002), Campa and Kedia (2002) and Maksimovic and Phillips (2008) find that diversified firms differ significantly from their focused counterparts in many respects such as style of investment, size, cash levels, valuation et cetera. Graham et al. (2002) study acquisition behaviour of firms and find firms tend to buy already discounted business units. Thus, it seems that diversification may not be the underlying cause of the discount.

Another part of a biased selection process is about the endogeneity of the decision to diversify. In this context, the sample of firms studied might not be a randomly assigned group from the population which leads to biased OLS estimates. Campa and Kedia (2002) and Villalonga (2000) attempt to correct the biased estimates and find that the observed discount disappears or even turns to a premium after the endogeneity issue is addressed. These findings give rise to a view that diversification and the discount are not causally connected. Nevertheless, Lamont and Polk (2002) and Ammann et al. (2012) find a significant diversification discounts in their samples even after controlling for the endogeneity issue.

[10] A much more detailed discussion is available at Erdorf et al. (2013).

B. COMPUSTAT database

The use of COMPUSTAT segment database in diversification discount studies is extremely widespread and is undoubtedly the most used source for data. The data is not without its problems, however. Researchers argue the segment data understates the true extent of diversification (Lichtenberg (1991)); business segments do not represent the true activities sufficiently well (Davis and Duhaime (1992)); changes in the number of segments does not only represent changes in diversification, but also in reporting standards (Denis et al. (1997) & Hyland and Diltz (2002)). Due to these reasons, the researchers argue, the use of COMPUSTAT data might cause miscalculation of many important variables used in empirical diversification studies. As an example of importance of data source selection, by using Business Information Tracking Series (BITS) instead of COMPUSTAT, Villalonga (2004) replicates the famous Berger and Ofek (1995) study and finds a significant premium in diversification, not a discount. She argues that COMPUSTAT data might in fact measure unrelated diversification and BITS data to measure related diversification, which might be an explanation for this dramatic change in the main results.

C. Measurement problems

Relevant measurement problems of the earlier literature relate mainly to flaws in Tobin's q as the measure of firm's future investment prospects (Whited (2001)) and as a valuation metric (Mansi and Reeb (2002), Glaser and Müller (2010), Ammann et al. (2012) & Custodio (2014))[11]. Furthermore, the large majority of studies exclude firms with financial segments from the analysis altogether.

More specifically, Mansi and Reeb (2002), Glaser and Müller (2010) & Ammann et al. (2012) view that it is incorrect to use book value of debt as a proxy of its market value when calculating Tobin's q. Intuitively, this should be an especially severe problem when firms suffer from financial distress such as during the 2007-2009 financial crisis. Custodio (2014) finds another flaw in the widely-used Tobin's q metric. He argues that as diversified firms are more active in the M&A market, they should have much higher amounts of goodwill on their balance sheets, which causes inflated q's. He finds that by goodwill-adjusting the q, the diversification discount drops substantially.

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[11] Despite its issues, Tobin's q is widely used valuation metric that has strong theoretical and practical benefits. By measuring the present value of all future cash flows divided by the replacement cost of tangible assets, the metric allows for comparison between firms without risk adjustment.

2.4. Diversification's effect is heterogenous across industries

The traditional way to study diversification discount has been to look at a wide range of industries, compile the data and find the average value differential between diversified and focused firms. Erdorf et al. (2012) in their survey of recent literature, conclude that more focus in research should be put towards investigating how conglomeration affects value in different industry settings and economic environments. This is indeed the area where the focal point of the researchers has turned to. Santalo and Becerra (2008) investigate the variation of the discount across industries and show that diversification's effect on performance is not homogenous, but instead seems to follow each industry's competitive landscape. The authors find diversified firms to perform better (worse) in industries with less (more) focused competitors. The underlying logic behind this finding is that if there are many diversified firms operating at a given industry, it is likely they have a comparative advantage over the focused competitors inside that industry. In short, the findings of Santalo and Becerra (2008) call for more emphasis for industry-specific analysis when investigating the diversification discount.

Some researchers have also begun to study the important sub-segment of firms, financial companies, in their search for the diversification discount.

2.5. Dynamic nature of diversification discount across the business cycle

Recent studies have found robust evidence that diversification seems correlate unevenly with value across different economic environments. During periods of higher financial constraints, the potential benefits from internal capital markets and debt co-insurance should be higher as well. The intuition is that when a firm has multiple income and financing sources, the restrictions imposed by the external market conditions are mitigated.

In general, financially constrained firms seem to be forced into making sub-optimal decisions which lead to losses in value that could be avoided with additional financing options. Campello et al. (2010) in their survey of 1,050 CFOs globally, find anecdotal evidence that financial constraints lead the firms to forego attractive investment opportunities. Some 86% of the surveyed constrained U.S. CFOs acknowledged their inability to invest optimally. What is more, the firms that were identified as constrained burned more cash, sold more assets and depended on credit lines more heavily.

Perhaps the first empirical evidence on the diversification discount aspect of this discussion is provided by Dimitrov and Tice (2006) who study both bank-dependent diversified and focused firms and find that diversified firms tend to perform relatively better than focused firms during recessionary periods. More specifically, they find the industry-adjusted inventory and sales growth of bank-dependent focused firms to drop more than bank-dependent diversified firms' segments. Consistent with debt coinsurance hypothesis of Lewellen (1971) and credit constraint hypothesis, the drop in net debt issuance is lower for diversified firms that are also found to have lower cash flow volatilities. The results hold even when controlling for the endogeneity of the diversification decision and survivorship bias. Another piece of evidence of diversification's dynamic effects on value is provided by Yan et al. (2010) who study the investment efficiency of diversified and focused firms under various capital market conditions. The authors find that during periods of distress, the investment levels of focused firms drop significantly but stay constant for diversified firms. Moreover, the internal capital markets financing for diversified firms grows more important when they are faced with constraints in the external capital markets. Consequently, as also backed up by their findings, the resulting loss of value during distressed periods is lower for diversified firms than it is for focused firms.

Gopalan and Xie (2011) show the diversification discount, as measured by excess value, declines dramatically during recessionary periods. In fact, the discount almost disappears during those years when one of the conglomerate's segments is under distress. The causes of this better performance by diversified firms can be traced back to fundamentals. The authors find the distressed segments of conglomerates report higher cash flows, R&D and sales growth than focused firms under similar conditions. It hence seems that internal capital markets can create value during binding economic conditions.

Prompted by these findings, Kuppuswamy and Villalonga (2016) study the effects of financial constraints to diversification discount in the most recent and relevant crisis period – the financial crisis of 2007 to 2009. Using robust methodologies, they find an average discount in their sample, which however declines during the financial crisis and disappears completely at the height of the crisis in late 2008. The researchers argue that this effect took place because the crisis amplified two main benefits of diversification. First, conglomerates had better access to credit due to risk reduction caused by debt co-insurance[12]. For the focused firms, access to

[12] Hann, Ogneva, and Ozbas (2013) provide proof to this type of argument by finding that diversified firms indeed have lower cost of capital than comparable single segment firms.

capital was more constrained as they are considered more risky investments than conglomerates. Consequently, focused firms may not be able to reach their optimal leverage levels and hence become disadvantaged to conglomerates. The authors argue that the second channel of value creation is that conglomeration provides access to efficient internal capital markets during crisis periods[13]. The findings of Kuppuswamy and Villalonga (2016) strongly support the view that corporate diversification may provide a valuable insurance function for investors which protects portfolios against systematic risk. Beyond insurance value, the more flexible access to credit of conglomerates may offer them unique investment prospects in economic environments where their competitors are facing higher financing constraints. The authors note that the insurance value of diversification is likely to be more pronounced when the firm pursues unrelated rather than related diversification.

Overall, there appears to be mounting evidence that corporate diversification increases its usefulness in binding economic conditions.

2.6. Diversification discount in financial firms

Omitting firms with financial segments is a common practice in studies about diversification and hence, the important sub-segment of firms is relatively unstudied. However, financial firms, especially banks, are the focus of many important theories and empirical papers, some of which clearly relate to diversification. During the past decade, diversification discount among financial conglomerates has also emerged as an area of interest to researchers[14]. Similarly, as with non-financial firms, theory offers no clear prediction of how conglomeration of activities in the financial sector should affect shareholder value. Empirical findings are also mixed in the sub-segment of financial firms, but generally point towards an average conglomerate discount rather than a premium.

In this sub-section, I first summarize the most relevant theories of financial intermediation that relate to the theme of this thesis and then continue to review some recent empirical findings about diversification discount within financial conglomerates. Furthermore,

[13] See Section *2.1.C* for the theories of internal capital market's potential benefits.

[14] I argue, as detailed in *Section 2.5.C*, that bank diversification may have been understudied due to the historic regulatory separation of commercial and investment banking activities.

I shortly review some of the important aspects of bank regulation which have had, and continue to have, an effect on bank diversification in the U.S.

A. Theories of diversification among financial intermediators

Firstly, it is useful to consider why financial intermediators, or banks, would want to diversify their activities. The motives for diversification covered in *Section 2.1* form a useful framework for evaluating banks as well, but do not offer a complete understanding due to several fundamental differences between banks and non-financial firms. Some additional motives for bank diversification include the following. Firstly, conglomeration may decrease the costs of providing incentives to perform delegated monitoring and hence increase valuations (Diamond (1984)). Second, it can make relationship lending more efficient and hence increase the efficacy of financial intermediation (Petersen and Rajan (1994))[15]. Furthermore, much like non-financial corporations, banks can benefit from their internal capital markets which Houston et al. (1997) deem to be more efficient than with non-financial companies. Hence it is also possible the internal capital markets of banks are especially valuable during periods of higher financial constraints. One the flipside, banks are likely to pursue related diversification to a greater degree than non-financial companies, which could mitigate the possible value gain during distressed periods.

Economies of scope have also potential to play a large role in the banking industry. The works of Diamond (1991), Rajan (1992), and Stein (2002) all predict that there could be significant economies of scope in financial intermediation. For example, during the process of making loans the bank may efficiently offer other services such as securities underwriting or brokerage services to the customer. On a personal note, the importance of economies of scope may be strengthened by the view that banking relationships are long-lasting and customers have one or few 'main' banks. Hence, in theory, banks would benefit from organizing their activities in a form of a conglomerate to be better able to utilize the economies of scope and thus reach higher valuations.

On the other hand, banks, just like non-financial firms, are likely to suffer from the negative consequences predicted by agency theory that were illustrated in *Section 2.1.A.* In fact, due to the higher moral hazard regarding especially the largest of banks, the agency issues

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[15] Drucker and Puri (2005) study concurrent lending and underwriting behavior of investment and commercial banks. In support of the relationship banking-effect and economies of scope they find that concurrent lending helps banks to build profitable relationships with their customers.

might be more pronounced. Relatedly, the implicit "too big to fail" (TBTF) guarantees have the potential to increase the valuation of large bank conglomerates. The bank managers and investors might deem the bank as TBTF and expect a government bail-out in case of a bankruptcy due to high systemic risk they pose. This, as argued by Gropp et al. (2010), creates a situation where it is desirable to reach the TBTF state, which reduces the bank's bankruptcy risk and hence may increase its value. In this case, diversification, or inorganic growth, does not create value, but rather the implicit (or explicit) guarantees of the government[16].

Thus, diversification of financial intermediaries may be beneficial if the company insiders do not expropriate too much company resources in the form of private benefits and if the internal capital markets funding leads to efficient investments. However, as noted by Laeven and Levine (2007): "Empirically, it is extraordinarily difficult to measure economies of scope in the provision of financial services or to measure agency problems in financial conglomerates". Hence, to avoid the difficulties of measuring these factors directly, researchers often study diversification's effect on value and then hypothesise where the effect comes from.

B. Empirical findings of financial conglomerate discount

Laeven and Levine (2007) provide conclusive international evidence of a discount within banks using a sample that covers 43 countries[17]. They find a diversification discount of around 6-10% which persists after controlling for endogeneity, M&A activity, size and several other factors. Much like in other studies, rather than measuring directly the opaque agency costs and economies of scope, they investigate whether diversity of activities affects firms' market values. Specifically, they examine if excess value, the difference between actual Tobin's q and activity-adjusted q, is affected negatively by increases in the diversity measures. The method allows to analyse whether the Tobin's q of a conglomerate is more or less than its q if its activities were split into a portfolio of specialized banks. The authors measure the diversity of activities by distinguishing two groups of focused firms; commercial banks who take deposits and give out loans and investment banks who underwrite securities and offer a variety of other fee generating services. Each bank is then placed in a continuum between these two activities where the middle-ground indicates diversification. The results of the study

[16] In support of the importance of the TBTF guarantees, Brewer and Jagtiani (2013) estimate that a bank paid on average $14bn in added premiums in M&A market to reach the TBTF state in 1991-2004. Furthermore, these deals were coupled with positive reactions from both the bond and stock markets.

[17] Schmid and Walter (2009) offer some amount of critique to the study by not including a wider range of companies and by not considering the possible effects of survivorship bias.

suggest that the economies of scope are not sufficiently large to counter the other value-destroying factors such as intensified agency problems.

On the contrary, Elsas et al. (2010) find evidence of a diversification premium in their sample of banks from 1996 to 2003 that covers nine countries. The key difference between these two studies is the methodology. Elsas et al. (2010) find diversity of activities to affect bank market-to-book multiples indirectly through revenue diversification that increases the bank profitability.

Schmid and Walter (2009) provide U.S. evidence and find conglomeration to destroy value among U.S. based financial intermediaries, apart from investment banks and bank-insurance corporations[18]. Interestingly, the authors report a substantial diversification premium for the largest financial institutions which could relate to the already mentioned "too big to fail" guarantees.

European evidence for financial conglomerate discount is mixed, but points towards a positive connection between diversity and value. Baele et al. (2007), in their sample of European banks, find a strongly positive relationship between bank diversification and value. Van Lelyveld and Knot (2009) provide evidence for European bank-insurance corporations during 1990-2005 and do not find diversification discount, nor a premium, in their sample on average but note that in the more recent time-periods the markets have viewed diversification more positively. Intuitively, the difference between U.S. and European findings could somehow relate to the difference of importance between capital markets and loan based funding between the continents. One other explanation for the contrasting findings in U.S. and Europe could be bank regulation. For example Baele et al. (2007) argue that bank deregulation took place in Europe one decade before the U.S. and hence European banks have had more time to diversify and could thus be in a state of more efficient diversification than the U.S. based banks.

Other findings indicate there is a diversification discount among Chinese banks (Berger et al. (2010), diversifying mergers hurt bank shareholders (DeLong (2001)), removal of government bail-out guarantee decreases the risk taking of a bank (Gropp et al. (2010)) and diversifying acquisitions into investment banking activities create value (Filson and Olfati (2014)).

C. Bank regulation in the U.S.

As detailed by Barth et al. (2010) the U.S. financial industry has historically been highly regulated. In my view, this regulatory stringency is one of the main determinants of the current state of the U.S. banking sector. Regulation is a major factor in determining the current characteristics of individual banks in the system and for that reason has a great impact on the samples used in the diversification studies of financial conglomerates. Hence, a very brief summary of the most important regulatory developments follows.

First piece of important bank regulation occurred in 1933 after the Great Depression in the form of Glass-Steagal Act which effectively separated the activities of investment and commercial banks. It was not until 1999 that these restrictions were fully removed by the Gramm-Leach-Bliley Act and conglomeration of activities became possible. Consequently, it is clear why financial-firm diversification discount studies have only emerged relatively recently.

Another piece of regulation that has shaped the current U.S. banking sector were the restrictions on banks' geographic expansion between states. These controls limited the banks' ability to expand outside their home states. These restrictions gradually diminished in the 1980s after individual states were given legislative power over the issue. Federal legislation that unified the state legislation and enabled full inter-state banking was passed in 1995. This piece of legislation is one key factor that explains the formerly high fragmentation of the U.S. banking industry[19].

Finally, the financial crisis prompted a legislative responsive in 2010 by the Dodd-Frank Act. Perhaps the most important part of the legislation for financial conglomerates was the Volcker Rule which came in to force in July 2015. The Rule limits to some extent the investment banking activities of commercial banks, but not as strongly as Glass-Steagal Act did. Still, Dodd-Frank may have caused some diversification-reducing effects in recent years as banks have prepared for the new rules.

[19] Both Europe and U.S. exhibit strongly declining trend in the number of credit institutions. Federal Deposit Insurance Corporation's (FDIC) deposit insurance scheme covered 12,329 banks in the U.S. in 1990, 8,564 in 1999 and 5,330 banks in 2015 (available at https://www5.fdic.gov/hsob/HSOBRpt.asp). According to ECB, there were 7,906 registered Credit Institutions in the euro area in Dec 1999 and 5,453 in Dec 2015 (available at: https://www.ecb.europa.eu/stats/ecb_statistics/escb/html/table.en.html?id=JDF_MFI_MFI_LIST)

2.7. Summary of the literature review

Firms have several rational reasons to diversify. Although many of these motives are intuitive, they offer no clear prediction of what is the net effect of diversification on value. Hence the relation between diversification and firm value has been studied extensively. At first sight, firms were thought to lose value in their act of diversification into several activities. The recent evidence points to a more complicated reality. Diversification has a heterogenous impact on value in different industries, and its value seems to grow uniformly during recessionary periods by alleviation of financial constraints and by enabling more efficient use of capital.

There are holes in the research, however. A glance at the understudied yet important subset of firms – banks – during the financial crisis could provide more information on the possible insurance value in diversification. Furthermore, the U.S. banking sector has developed rapidly since the turn of the century and hence, a fresh look is needed to establish a) whether there is a diversification discount and b) how it has varied in time.

3. Data and methods

In this section I describe the sample of banks, key variables and main methods of this study. First, I describe the sample of banks and the source for data. Second, I detail the methods of measuring bank diversity and how diversity's effect on value can be established. Third, I describe the relevant explanatory variables. I conclude with a section involving the testable hypotheses.

3.1. Data

A. Sample of banks

The fundamental and pricing-related data comes from Thomson Reuters Worldscope, from hereafter "Worldscope", which contains quarterly data on listed U.S. banks. Banks that do not have market values are omitted from the sample since market valuations are a vital part of my analysis. I require that banks report basic accounting items such as total assets, net loans, interest income and non-interest income. The resulting sample of 405 U.S. banks, is compiled by using the industry classification ICB 8300 (Financials: Banks) by also requiring that the banks report financial statements for the date of the sample period start, Q1-2006. Those banks that reported the required fundamental data during this starting period are then followed until Q4-2016 with no requirements on their survival. The method of sample selection follows that of Kuppuswamy and Villalonga (2016) and enhances the sample characteristics by overcoming any *survivorship bias*. To reduce the risk of outliers distorting the regression estimates, I winsorize the valuation metrics of Tobin's q and market-to-sales at 1% and 99%. The main reason I conduct this study by quarterly data is that I could follow the methodology of Kuppuswamy and Villalonga (2016) in determining the specific effects of the financial crisis to the diversification discount. In general, quarterly data allows me to investigate the time-variation of the discount more meticulously.

Now, as I am interested in the diversity of bank activities between commercial and investment banking, it is useful to detail what I exactly mean by those activities. In this paper's context and following the work of earlier authors, an investment bank here refers to a financial institution which has a high share of non-interest income and hence mostly participates in non-lending activities. Similarly, a commercial bank is a traditional loan-making bank that generates mostly interest income.

To facilitate my analysis, it is important to have both specialized investment and commercial banks in my sample. The ICB 8300 contains plenty of specialized commercial banks and plenty of diversified investment and commercial banks. It lacks, however, specialized investment banks. Hence, to obtain specialized investment banks to my sample, I analyse the Standard Industry Classification, or SIC, codes of U.S. based financial firms. The rationale behind using SIC codes is that firms have the obligation to report material segments under SFAS 131, and most firms choose to do this segmentation based on business segments rather than geographic segments (Berger and Hann (2003)), which in turn reveals information about firm's extent of diversification. Thus, to find focused investment banks, I require that a firm has only segments that are classified under the two-digit SIC code of 62 (Security and Commodity Brokers, Dealers, Exchanges and Services) and that it does not report any other SIC codes such as 60 (Depository Institutions) or 63 (Insurance). The resulting sample of investment banks includes 12 investment banks of various sizes and types and contains well-known names such as Goldman Sachs, Morgan Stanley and Charles Schwab and smaller asset managers such as Janus and Eaton Vance[20].

After adding the pure-play investment banks to the sample, the final sample size reaches 405 banks and 15,936 bank-quarter observations.

B. Source for data – Worldscope

Previous studies on diversification discount use mostly other sources than Worldscope for company-level data. The most prevalent data source, although problematic as discussed in *Section 2.3.B*, for conglomerate discount studies is by far the COMPUSTAT Industry Segment database, which contains firm-level quarterly segment data from 1977 onwards for a large number of firms. However, the COMPUSTAT data regarding financial firms is limited. Laeven and Levine (2007) summarize the issue by stating," ...given all these limitations, we cannot apply the Lang and Stulz (1994) chop-shop approach to U.S. banks based on COMPUSTAT data". Alternative source, on which the most well-known financial conglomerate discount studies (for example Laeven and Levine (2007), Van Lelyveld and Knot (2009)) have capitalized on is Bankscope. Regrettably, this product is currently unavailable as it was closed on 1st of January 2017.

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[20] The number of focused investment banks is low at 12 banks, but it should not materially affect the results of this exercise. After all, the specialized investment banks are only needed to find the average valuation of investment banking activities in each quarter. Hence, the only requirement is that they generate a suitable average of specialized investment banking activities.

Fortunately, Thomson Reuters Worldscope is also recognized as a viable source for data and has been used before in diversification discount studies which include studies of Lins and Servaes (1999) and Mansi and Reeb (2002). What is more, as pointed out by Laeven and Levine (2007), Worldscope is a potential source for data for financial conglomerate discount studies. The authors report a high correlation between Bankscope data and Worldscope measures of bank activities, but note that the sample is larger for Bankscope. I counter the possibility of small sample size issues by noting the over 400 bank sample size. The resulting bank-quarter observations should be more than sufficient for this study. Furthermore, the utilization of the relevant methods can be accomplished with the Worldscope data.

A potential upside of using Worldscope data over COMPUSTAT is that it allows me to avoid the issues of COMPUSTAT segment database. The issues were detailed in *Section 2.3.B,* but an especially important flaw in COMPUSTAT is that the database measures diversity in a way that it strongly weights the negative consequences of diversity, and hence may downplay the beneficial aspects and lead to biased inferences about the existence of a diversification discount. In other words, as argued by Villalonga (2004) COMPUSTAT aggregates data in such a way that it measures unrelated diversity, not related diversity.

3.2. Methods

I largely follow the methods of Laeven and Levine (2007) in determining whether there is an average diversification discount among financial conglomerates. Following their methodology, I first calculate measures of bank diversity and then calculate excess values based on a modification of Lang and Stulz's (1994) and LeBaron and Speidell's (1987) chop-shop method. The modified method differs in many respects from traditional non-financial firm diversification discount studies' methods that mostly utilize SIC codes to determine the extent of diversity. Since I also use SIC codes to complement the analysis, my method can be viewed as a hybrid between the traditional methods and those of Laeven and Levine (2007). After describing the valuation methods, I move on to methods that concern the time-variability of the discount. In this regard, Kuppuswamy and Villalonga's (2016) study of non-financial firm diversification discount during the financial crisis serves as a valid frame, complementing and

strengthening the previous part of the analysis[21]. In the following paragraphs, I elaborate the used methods more closely.

A. Measuring bank diversity

I measure bank diversity by two complimentary measures - by a continuous measure and a dummy.

Regarding the construction of the continuous measure of diversity, consistent with Laeven and Levine (2007), I first separate each bank on a continuum between a commercial and an investment bank. A focused commercial bank, for example, converts deposits into loans and hence receives interest income. Conversely, a focused investment bank underwrites securities, manages investment assets or offers other financial services, but does not take part in activities that generate loans. Financial conglomerates are in the middle ground of this spectrum and perform many different activities between the two extremes. Citigroup or Citi, for example, takes in deposits, gives out loans, underwrites securities and offers a wide range of financial services such as brokerage, asset management and capital markets origination. The activities of Citi can be roughly divided into two, those that generate interest income and those that generate fee income.

To find the place in the continuum for each bank, I use income and asset based measures of activities. The income based measure is the ratio of $interest\ income/sales$ and the asset based measure is the ratio of $net\ loans/earning\ assets$. Commercial banks that specialize in loan-making have high ratios whereas focused investment banks have very low ratios.

Next, I calculate two continuous measures of bank diversity based on the bank activities. The metrics are conceptually similar as in Laeven and Levine (2007), but due to different data sources they differ somewhat. In this study, they are defined as follows.

$$Asset\ diversity = 1 - \left|\frac{Net\ loans - investments}{Net\ loans + investments}\right| \quad (1)$$

[21] Especially important takeout from the methods of Kuppuswamy and Villalonga (2016) is the use of time-varying bank valuation metrics when calculating the excess values.

$$Income\ diversity = 1 - \left|\frac{Interest\ income - Noninterest\ income}{Sales}\right| \quad (2)$$

The two measures are continuous and always between 0 and 1 with a larger value indicating a higher degree of diversity. For example, a bank is considered fully diversified with the asset diversity measure if its net loans equal its investments. On the other hand, if interest income or non-interest income is zero, the income diversity measure is zero which indicates complete bank focus in one activity.

The asset diversity measure is the same as in Laeven and Levine (2007), who use Bankscope's other earning assets rather than investments. Worldscope simply aggregates the sub-items of 'other earning assets' into 'investments' and so the measures are identical. Regarding the income diversity measure, Laeven and Levine (2007) use net operating income-based items whereas I use gross sales based. In measuring bank diversity, the authors favour the asset based measure because many loans yield fee income that is not counted into interest income but rather to non-interest income. Then again, considering that some banks may hold high amounts of off-balance sheet items, even the asset based measure has its flaws. Therefore, I include both measures of diversity as it is not entirely clear which one is methodologically more favourable.

An alternative measure of diversity complementing the continuous measures is a diversification dummy which takes a value of one if the banking institution is diversified. The firm is categorized as '*diversified*', and the dummy equals 1, if the bank is not specialized into neither commercial nor investment banking, but mixes these activities. Diversified bank is bank that is not defined as a specialized investment bank by SIC codes and its $interest\ income/sales$ or $net\ loans/earning\ assets$ ratio is below 0.9[22].

B. Diversification's effect on value

Following numerous other diversification discount studies, I use Tobin's q as the main valuation metric. Tobin's q is the sum of book value of preferred shares, market value of common equity and book value of debt divided by book value of total assets. In principle, Tobin's q is the present value of future cash flows divided by the replacement cost of all assets.

[22] The 0.9 activity-share which is the upper limit for being diversified, is identical with the one used in Laeven and Levine (2007). The authors use a lower limit of 0.1, which I substitute with the banks I identify as specialized investment banks by using SIC codes.

Lang and Stulz (1994) note that by using Tobin's q instead of other performance metrics, one can avoid many problems. They argue that since the q captures the riskiness of cash flows, no risk adjustment or normalization is necessary when comparing the q across firms. However, as noted in section *2.3.A*, Tobin's q also has a few disadvantages. Most importantly, the book value of debt does not reflect the market value if the firm is facing high costs of financial distress. Secondly, as argued by Custodio (2014), the denominator of Tobin's q is inflated as it does not account for diversified firms' higher activity in the M&A market, a fact which results in larger amount of goodwill on their balance sheets. However, this does not seem to be the case in the banking sector which suggests that the goodwill adjustment can be safely ignored[23]. Another potential issue with Tobin's q is that banks are firms with high leverage, which causes the equity value component in the q's numerator to be small in relation to the debt component. This in turn, makes Tobin's q quite time-invariant, if the book values of debt are used.

In an effort to increase the robustness of this study I use market-to-sales ratio as a complimentary valuation metric in the second part of the my analysis. Market-to-sales ratio is also a widely used in diversification discount studies and by using it, one can avoid some issues of other valuation metrics that were discussed above[24].

Although both Tobin's q and market-to-sales ratio can be directly compared between diversified and focused firms, most contemporary studies use excess values as the dependent variable. Excess value is often calculated in one of two ways. When the valuation metric is Tobin's q excess value is the difference between the actual q and the 'imputed' or calculated q. When market-to-sales based metric of valuation is used, the excess value often refers to the natural logarithm of actual value of a firm divided by its imputed value. With both calculation methods, excess value is the valuation difference of bank's actual value and the value that it would have if its segments were split into separate financial 'shops' and the main benefit of utilizing it is that it controls for the potential valuation difference of bank's activities. For example, fee income generated from the investment banking activities might be valued more than interest income generated from loan-making activities.

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[23] The mean of goodwill to assets in my sample is 2.3% in comparison with 6.0% of Custodio (2014). In addition, the diversified bank (both income or asset measure) mean goodwill to assets is only 1.8% which indicates that the diversified banks are not as active in the M&A market as specialized banks.

[24] For example, the metric is used by Kuppuswamy and Villalonga (2016) and Schmid & Walter (2009) along with market-to-assets ratio.

I construct the Tobin's q based excess values by using the modified chop shop method. The imputed value of each bank is calculated as the weighted average of the share of each activity times the average valuation of that specific activity. Omitting time-subscripts, the general formula is as follows:

$$Imputed\ q_j = \sum_{i=1}^{n} \alpha_{ij} * q^i \tag{3}$$

In the equation, q de notes Tobin's q. As the main point of interest lies between two activities, commercial and investment banking, the bank-specific formula gets the following form:

$$Imputed\ q_j = \ \alpha_{j1}q^1 + \alpha_{j2}q^2 = (\alpha_{j1}q^1 + (1 - \alpha_{j1})q^2) \tag{4}$$

Thus, bank j's imputed Tobin's q is the sum of share of commercial banking activity $[\alpha_{j1}]$ times the median Tobin's q of specialized commercial banks $[q^1]$ and share of investment banking activity $[\alpha_{j2}]$ times the median Tobin's q of specialized investment banks $[q^2]$. Again, α_{j1} is one of the two activity measures of $net\ loans/assets$ or $interest\ income/sales$ for bank j.

Excess value is the difference of the actual valuation and the imputed valuation. Hence, for bank j, it is calculated as follows:

$$Excess\ value\ (q)_j = \ q_j - \left(\alpha_{j1}q^1 + \alpha_{j2}q^2\right) = \ q_j - \left(\alpha_{j1}q^1 + \left(1 - \alpha_{j1}\right)q^2\right) \tag{5}$$

Next, to measure the q^1 and q^2, or the specialized bank q's, I define what exactly constitutes specialization. For the commercial banks, I use the same definition of specialization as Laeven and Levine (2007). Specialized commercial bank is hence defined in two ways; either by having higher than 90% share of $net\ loans/assets$ or by having more than 90% share of $interest\ income/sales$. As noted in Section 3.2.A, I gather the specialized investment banks manually into the sample by using SIC codes. In the first part of my analysis, I average these valuation metrics across the whole sample period to get the specialized investment banking q's.

In the second part of my analysis, I include market-to-sales based excess value as a complimentary valuation metric and I allow time-variation of the specialized bank valuations which in the initial analyses are held fixed. As mentioned earlier, the market-to-sales based excess value is calculated somewhat differently, although the construction of measures of diversity and calculation of imputed q's are identical. Following Kuppuswamy and Villalonga (2016), I calculate the market-to-sales excess value as the natural logarithm of the ratio between a firm's market value and its imputed value at the end of each quarter. The imputed market-to-sales ratio of each bank is the weighted average of the extent of its activities in commercial and investment banking multiplied with the median market-to-sales ratio of specialized commercial and investment banks at the end of each quarter[25]. The imputed ratio is then multiplied with the most recent annual sales of the bank to find the bank's imputed value.

3.3. Explanatory variables

Along with the two measures of diversification and two valuation metrics, I use several control variables to be able to establish a more robust connection between diversification and value. I use of the following explanatory variables in the regressions:

Total assets: Following Lang and Stulz (1994) and other seminal articles of diversification discount, I use the natural logarithm of total assets to control for firm size. Size has many potential benefits which potentially add value through economies of scale. If size categories variable is used, this variable is omitted.

Size categories: For banks, the size of their balance sheet is an especially important control variable. As detailed in *Section 2.5.A*, if the bank reaches the 'TBTF' state, it is likely to create value for the shareholders due to decreased risks. Hence the relation between size and value could be non-linear and not fully captured by total assets. For example, the bankruptcy of a medium sized bank would not have many effects to the banking system, whereas the collapse of a large, nationwide bank would trigger widespread turmoil in the entire banking system. In this largest category of banks, value may be created by the government implicit 'guarantee' that the bank will not be allowed to fall in avoidance of damaging the entire banking system. Hence, I divide the banks into five distinct size categories and use the resulting dummy

[25] The definition of what constitutes specialization is the same as earlier.

variables to investigate the value effect with special interest in the largest segment of banks. If total assets variable is used, these variables are omitted. The size categories are:

- *Micro*: Total assets below $300m
- *Small* (default category): Total assets between $300m and $2bn
- *Medium*: Total assets between $2bn and $10bn
- *Large*: Total assets between $10bn and $50bn
- *TBTF (too-big-to-fail)*: Total assets above $50bn

Interest income to sales: This control variable is used in regressions where the valuation metric of each bank is Tobin's q and diversity is measured by income diversity. The main reason for the inclusion is that this variable captures the valuation difference between commercial and investment banking income and hence helps to extract diversity's effect on value.

Loans to total assets: This variable is included for the same reasons as interest income to sales, and used when Tobin's q is the dependent variable and asset diversity measures diversity.

Market share of deposits: This variable is a possible indicator of the degree of market competition that the bank faces. Laeven and Levine (2007) argue that a higher market share of deposits signifies lower competitional pressure from other banks and may lead to market power which potentially increases bank's current valuation. Theoretically, the level of competition the bank faces could affect bank's governance and could capture some of the variation in diversity that explains each bank's excess value.

Deposits/liabilities: This variable controls for bank's extent of access to cheap and subsidized deposit-based funding. The government's deposit insurance scheme is theoretically an important concept for risk-taking incentives and valuation.

Equity/assets: The so called 'equity ratio' is an important determinant for bank's risk and thus potentially valuation. Specifically, a better capitalized bank may have less incentives to take excessively risky projects that have negative NPVs. Thus, one would expect excess values and the Equity ratios to have a positive correlation.

Risk-free rate: The level of the risk-free rate is an important consideration for banking institutions as it has direct linkage with demand for loans and possibly the bank lending margins. In principle, it reflects the prevailing conditions in the lending market, but also in the

whole economy. Also, it might be possible for banks to be able carve our larger interest margins in high interest rate environments, hence affecting profitability.

Inflation: I also include market-level control variables in some of regressions. It has been shown by for example Boyd, Levine, and Smith (2001) that level of inflation has significant effects on financial sector performance and perhaps even to diversification decisions. In particular, bank lending activity seems to be negatively related with inflation in countries with low-to-moderate rates of inflation. Hence, the level of inflation could possibly explain some variation in bank values.

CBOE volatility index, the "VIX": According to Chicago Board Options Exchange (CBOE), the CBOE volatility index, or more familiarly the VIX, is a time-series of the implied 30-day volatility of the options on S&P 500 index. The metric is commonly referred to as 'the fear gauge' of the markets. For example, the metric rose to record highs after the Lehman Brothers collapse in late 2008, which many consider as the peak of the financial crisis's uncertainty. Generally, the metric is a good proxy for the next month's expected uncertainty in the U.S. equity market, and is here used to control for the prevailing market conditions at end of each quarter to see whether diversification is more valuable during highly distressed periods.

GDP – growth: The quarterly annualized economic growth is a basic control for business cycle fluctuations. I include this variable in some regressions which exclude the VIX or the TED spread.

I measure the above explanatory variables at the end of each calendar quarter.

3.4. Testable hypotheses and summary statistics

A. Testable hypotheses

In this paper, I make three main hypotheses which I test empirically by using several methods of statistical inference. As explained in the literature review, earlier research has found a diversification discount among U.S. financial conglomerates. Another main finding has been that the value in diversification seems to change in time and increases when non-financials firms become financially constrained i.e. during recessionary periods. The effect of the financial crisis on the diversification discount of financial conglomerates has not been studied before. In addition, it is possible the financial crisis affected investors' perceptions on

diversification, resetting the discount altogether. The three testable hypotheses are then as follows.

Hypothesis 1: "Conglomeration of activities among U.S. based banks is connected on average to a significantly lower value of these institutions in relation to specialized banks".

Hypothesis 2: "During the financial crisis, the average level of the diversification discount decreased significantly."

Hypothesis 3: "After the financial crisis, diversification of bank activities has been associated with smaller diversification discount than during the run-up to the crisis."

I test the validity of these hypotheses by using several complementary methods, which mostly rely on pooled Ordinary Least Squares (OLS) regressions. The estimated regressions differ in terms of dependent variable that measures valuation and explanatory variables which include measures of diversity and other control variables. The general OLS regression model for testing Hypothesis 1 is the following:

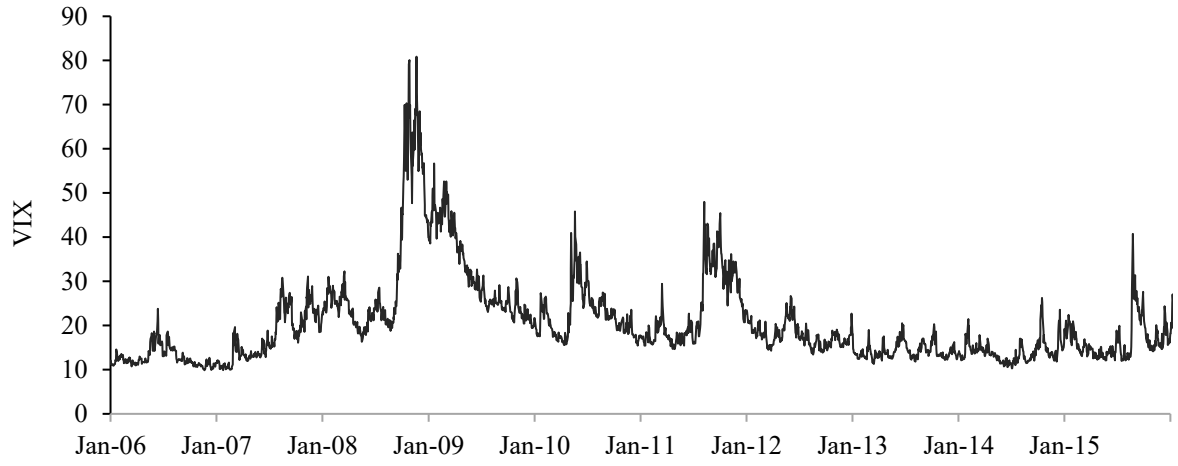
$$Valuation_{j,t} = c + \beta^1 Measure\ of\ diversity_{j,t} + \sum_{2}^{n} \beta^n control\ variable_{j,t} + \varepsilon_{j,t} \quad (6)$$

For empirically testing the *Hypothesis 2*, I employ similar but modified methods of Kuppuswamy and Villalonga (2016) who study the effect of financial crisis to the diversification discount. For this OLS regression, I use excess value as the dependent variable, I measure diversity with a diversification dummy, and use similar set of control variables as in *Equation 6*.

I use two different methods in controlling the effects of the financial crisis to the excess value of each bank. First, I use simple crisis period dummies to identify the various phases of the crisis. I categorize four main periods with the dummies: run-up period to the crisis at 2006Q1 to 2007Q2, early-crisis period at 2007Q3 to 2008Q3, crisis-peak at 2008Q4 to 2009Q1 and post-crisis 2009Q2 onwards. The early-crisis period is characterized by constantly increasing volatility and market jitters including the sudden collapse of the investment bank Bear Stearns in 2008Q1. The crisis-peak captures the period of highest volatility including the collapse of the Lehman Brothers in 2008Q4. Using crisis period dummies allows me to investigate whether the average level of the discount was different during specific periods of the crisis, as compared with times of relative stability before and after the crisis.

Second, I use the CBOE Volatility Index (VIX) as a continuous measure of the crisis' severity. *Figure 1* below, illustrates the development of the VIX. In 2006, the the VIX began its increase, breaking the level of 30.0 in August 2007 and finally 80.0 in 27th October 2008 and 20th November 2008. These spikes coincide with the most volatile periods of the crisis.

Figure 1 *VIX development*



To analyse how diversity affects value in different phases of the crisis and its aftermath, I employ an interaction dummy between the diversification dummy and the measures of the crisis. The generalized version of this regression is hence as follows.

$$Excess\ value_{j,t} = c + \beta^1 Dummy\ of\ diversification_{j,t} + \beta^2 Measure\ of\ crisis + \beta^3 Dummy\ of\ diversification * Measure\ of\ crisis + \sum_{4}^{n} \beta^n control\ variable_{j,t} + \varepsilon_{j,t} \quad (6)$$

To improve the reliability of the results, I perform several robustness checks. To address possible issues relating to heteroskedasticity, I utilize standard errors clustered by the firm in the regressions. Additionally, I perform Variance Inflation Factor tests for the main regression models, which I use to quantify the degree the main variables of interest suffer from multicollinearity. In later regressions, to account for the possible changing nature of bank valuation metrics, I employ time-varying imputed q's when calculating bank excess values.

A discussion of the results and of their limitations is available at Section 5.

B. Summary statistics

Before detailing the main methods of discerning whether there is a diversification discount, I provide some summary statistics concerning the sample of banks. *Table 1* offers the statistics on the main variables, such as Tobin's q, market-to-sales and diversity measures.

Averaging across all bank-quarter observations, the average interest income to sales is 82% and the average loans to earning assets is 72%. Both measures can be considered quite high and illustrate the sample's high number of banks that concentrate on lending activities rather than investment banking activities. The average income and asset diversity measures for the banks are 0.37 and 0.52, respectively. Variation in the income and asset diversity measures are moderate as indicated by the standard deviations of approximately 20%. It should also be noted that on average the banks are not fully diversified, i.e. the average asset or income diversity is not one. Rather, the banks seem to, on average, focus on either commercial or investment banking in their operations.

The correlation between the main valuation metrics of Tobin's q and market-to-sales is 67%, indicating strong, yet not overly strong, dependence. One should note the much higher standard deviation of the market-to-sales metric, 1.34 versus 0.23 for Tobin's q. Measures of bank activities, where the bank lands in the continuum between commercial and investment banking, interest income to sales and loans to earning assets have a more modest correlation of 27%. One would expect this figure to be higher, which calls to question if the indicators measure two different activities. As explained in *Section 3.2.A*, there are potential inherent biases in the measures, which could help to explain the low correlation. Furthermore, the quarterly nature of the data in conjunction with comparing balance sheet and income statement items, may cause the correlation to be low between the measures.

To discover a diversification discount, the valuation metrics should have negative correlations with the asset diversity and income diversity measures. Looking at the summary statistics, this does not seem to be the case. Asset diversity measure is positively correlated with both Tobin's q (7%) and market-to-sales (13%), potentially indicating there is a positive dependency between diversity of activities and value on average. However, the income measure yields more mixed results as its correlation with Tobin's q is 3%, but -6% with market-to-sales. However, due to the reportedly fluctuating nature of the diversification discount, correlation may be a poor metric to base even one's initial opinions on.

Table 2 describes the development of the main variables in time. I split the sample in sub-samples based on the phases of the financial crisis of 2007-2009. For both the valuation measures, Tobin's q and market-to-sales, the development during the crisis period is roughly similar. Both started high during the run-up to the crisis, but later declined and reached a bottom at the crisis peak after Lehmann's collapse when the financial industry witnessed downward spiralling market values. After the crisis peak the Tobin's q measure of an average bank has not reached the levels seen in 2006, unlike market-to-sales multiple which has recovered to its former levels and above. The income side of the banks has also seemed to change since the time of the crisis; in the post-crisis period, the interest income to sales ratio has declined from 87% to around 80% whilst the income diversity has increased from ca. 30% to 41%. Similar development has also happened in the asset measure of bank activities, indicating that banks may have become more diversified since the crisis in terms of assets and income flows. Other noteworthy developments are that the banks have kept on average a similar equity ratio throughout the different periods and that funding by deposits has increased its popularity after the crisis.

4. Empirical findings

The empirical findings of this paper can be roughly divided into two parts in terms of findings and the robustness of the analysis. The first part, which principally follows the methods of Laeven and Levine (2007), attempts to discover the average connection between diversification and value over the entire sample period. The sample is treated as pooled and the plausible time-variance of the excess values or imputed q is not considered. The second part analyses the discount's time-variance and complements the analysis with the introduction of a second valuation metric, the market-to-sales ratio. In addition, sub-samples are analysed and the excess value is calculated in a way that allows for the time-variation in the specialized bank valuation.

4.1. Diversification discount on average with time-invariant imputed q's

A. Initial findings

Table 3 exhibits the initial findings on the possible diversification discount among financial conglomerates. The initial two rows of the table include the results from two separate OLS regressions where first Tobin's q and then Tobin's q-based excess value were regressed on a constant and a diversification dummy variable. As explained before, using Tobin's q as the dependent variable follows the older literature whereas excess value, that accounts for the valuation differences between different activities, is nowadays more commonly used. The initial results suggest there may be some form of a diversification discount within the range of the whole sample period. By using Tobin's q, the diversified firms seem trade at a discount between -7.1% and -8.6% depending on whether asset or income diversity is used to classify the diversification dummy. With excess values, this effect is much smaller and between -1.3% and -1.8%. The magnitude of the discount by Tobin's q measure of value is similar than in the study by Laeven and Levine (2007), but the discount's magnitude by using excess values is now much smaller. By looking at the rows three and four of the table, raw mean and median excess values for the diversified firms in comparison with the specialized firms, the figures remain on the negative territory, but borderline economic insignificance much like in the OLS excess value method.

There might be several explanations for these initial findings. Perhaps most importantly, by using excess value the potential valuation difference of investment banking

and commercial banking activities is addressed and hence the diversification dummy could better capture the valuation differential between specialized and diversified banks. In other words, the potentiality is captured that a bank with a high share of fee income that is generated from investment banking activities could be differently valued than the income from a bank that generates mostly interest income. Tobin's q does not incorporate this potentiality since the imputed q's of different activities are not deducted from the metric. Hence, the excess value is more prone to be the more accurate method of looking at the discount's average level throughout the sample.

Table 4 continues with the same theme, but adds more robust methods to the analysis and looks at the interconnectedness of the variables more closely. The columns between (1) to (4) report the OLS regression coefficients and t-statistics of a regression of excess value or Tobin's q on income or asset diversity and, in the case of columns (3) and (4), complimentary measures of bank activities. Comparing to the methods used in *Table 2*, the measures of diversity of activities are now continuous instead of being dummy variables. Furthermore, as the bank observations over time are not independent, the standard errors used in the regressions are adjusted for clustering at the bank level. After introducing the continuous measures of bank diversity, the results change significantly in comparison to those exhibited in *Table 2*. The new measures of diversity indicate there is a slightly stronger inverse connection between diversity and value when using excess value as the dependent variable, although the statistical significance of the regression coefficients declines as a result. The magnitude of the coefficient is in between -2.1% and -4.3%.

The regressions including Tobin's q as the dependent variable change more dramatically. Regressions models depicted in columns (3) and (4) add a measure of activity, either interest income to sales or loans to earning assets, to the regressions with the diversity measures. These additional activity-measuring variables attempt to control for banks' differing characteristics as commercial or investment banks, and hence help to distinguish the diversity's effect on value per se. The regression coefficients for the explanatory variables now imply a slight (largely statistically insignificant) positive connection between diversity and Tobin's q. It seems that diversity be connected positively to the absolute value of the banks, but negatively to the valuation differential between diversified and focused banks[26]. To establish a more

[26] I performed further robustness checks by the introduction of quarter-dummies to the regressions. This had no material impact on the regressions that use excess value as the dependent variable. For the Tobin's q regressions, this

robust causal average connection between diversity and value, I use a multivariate OLS regression model.

B. Multivariate OLS model

Table 5 illustrates the results from more comprehensive regression setups with several control variables that have potential in capturing essential parts of the model's variation. The analysis now controls for the prevailing economic environments and bank level characteristics in addition to bank activities. These variables were described in *Section 3.3* in more detail. The table is divided into two panels: *Panel A* describes the results from OLS regressions based on income diversity and the second, *Panel B*, describes findings based on asset diversity. In both panels, the columns (1) to (4) use excess value as the dependent variable whereas columns (5) to (8) use the actual Tobin's q. In *Panel B*, following Laeven and Levine (2007), I include an activity measure (either interest income to sales or loans to earning assets) to control for the combination of activities of each bank and separate its effect from the diversity measure.

Several distinctions regarding the output can be made in comparison to the former, more simpler models. Firstly, I continue to find a significant negative relation with the income diversity measure and bank excess values. The size of this discount is between 4% and 6%. However, when measuring the diversity of bank activities by asset diversity, there is no evidence of dependency. In the regressions that use Tobin's q as the dependent variable, it is difficult to infer anything definitive due to the mixed nature of the results. By income measure of diversity, the regressions coefficients are small and non-significant but by the asset measure of diversity there seems to be a slight, yet statistically significant, positive connection between diversity and Tobin's q.

Many of the control variables exhibit statistically significant relations with the dependent variables. The natural logarithm of assets, a potential proxy for economies of scale, is statistically significant in all of the model specifications, indicating that there is positive connection with bank valuation and size. Similar relationship is evident for deposits to liabilities, which after controlling for the risk-free rate, is statistically significant (or nearly so) in all of the model specifications. This suggests that by gathering cheap and government subsidized funding via deposits the banks can increase their valuations. Furthermore, the market share of deposits is statistically significant at 1% level in all specifications, indicating

that banks that control much of the deposit-stock may exert market power and reach higher valuations[27].

The explanatory variables that control for the prevailing economic environment, are also significantly linked with the valuations of the banks. All four, risk free rate, GDP growth, inflation and VIX are highly significant in all of the regression model specifications.

Even after introducing several explanatory variables to the regressions with excess value and Tobin's q as the dependent variables, it continues to be difficult to make solid arguments on whether diversity affects value on average. However, the excess value, the differential between actual value and imputed value, is inversely related with increases in the income diversity of a banking institution. In summary, as the bank becomes more diversified in the types of incomes it generates, the differential between actual value and imputed value decreases. This is an indication of a diversification discount, but it is contradicted by the other findings related to models using asset diversity and Tobin's q.

In further robustness checks I performed Variance Inflation Factor (VIF) tests on the models to find forms of multicollinearity that could affect the models' standard errors. There were no issues in the models that use excess value as the dependent variable, but rather high degree of multicollinearity was found in the Tobin's q regressions with the income measure of diversity[28]. Hence, the results with Tobin's q as the dependent variable should be viewed with some reservations.

4.2. Limitations of pooling data across the sample

Perhaps the main limitation of the models and methods covered above is that the specialized investment and commercial bank q's are held fixed through time by averaging them across the pooled sample. This causes the imputed q's to be quite stable which may not work in a setting where valuations change. The background was that, the sample of Laeven and Levine (2007) used annual data to cover only a five year period from 1998 to 2002 which did not include any wide-ranging upheavals such as the financial crisis. This study, however,

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[27] It is important to note that the bank size is already controlled for, and so does not distort the result. However, the correlation between market share of deposits and total asset is 0.95, giving rise to a potential issue relating to multicollinearity.

[28] The mean VIF for the model with the highest degree of multicollinearity is 3.18. The single largest spikes in single variables were found for income diversity and interest income to sales. These two were VIFs were 10.58 and 10.08, respectively. For the asset diversity, the mean VIF remains below two, with asset diversity and loans to earning assets exhibiting VIFs of 4.52 and 4.31, respectively.

covers an 11-year period including the financial crisis of 2007-2009, and comprises of quarterly observations. Hence, the assumption that the specialized bank valuation has held constant over the whole sample period is not realistic.

4.3. Diversification discount with time-variant imputed q's

To overcome the limitations described above, I employ the methods of Kuppuswamy and Villalonga (2016) who studied the non-financial firm diversification discount during the financial crisis by using quarterly data. The researchers note that it might be more beneficial to analyse the variance of the discount instead of its mean value. The authors employ a method wherein the specialized firm valuations are time-varying, measured at the end of each quarter for each cross-section, leading to increased variation in the imputed q's and consequently the excess value, which indeed seems a better representation of the reality and should hence yield more accurate estimates of the imputed values of the banks.

A. Initial findings

The following figures describe the development of the sample-wide valuation metrics of Tobin's q and market-to-sales.

Figure 2 Sample market-to-sales ratio development over time

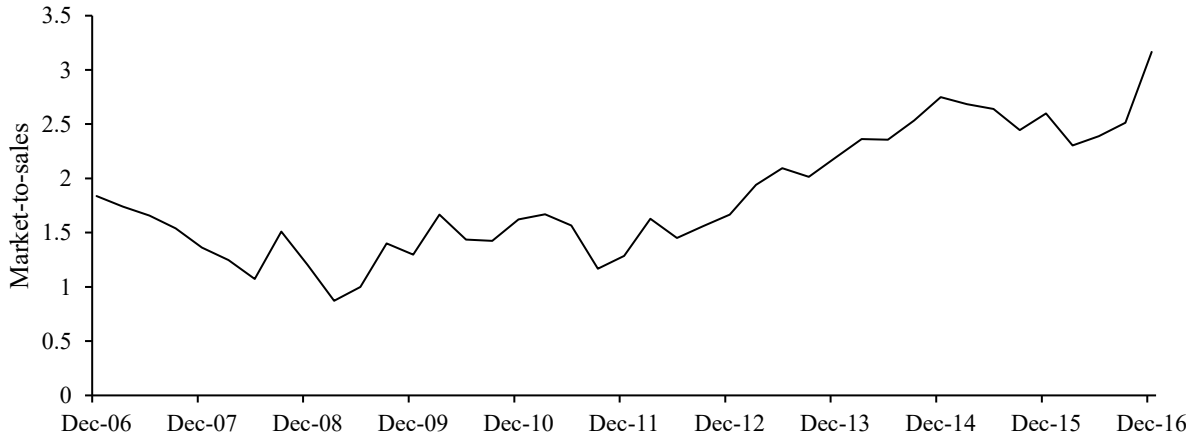
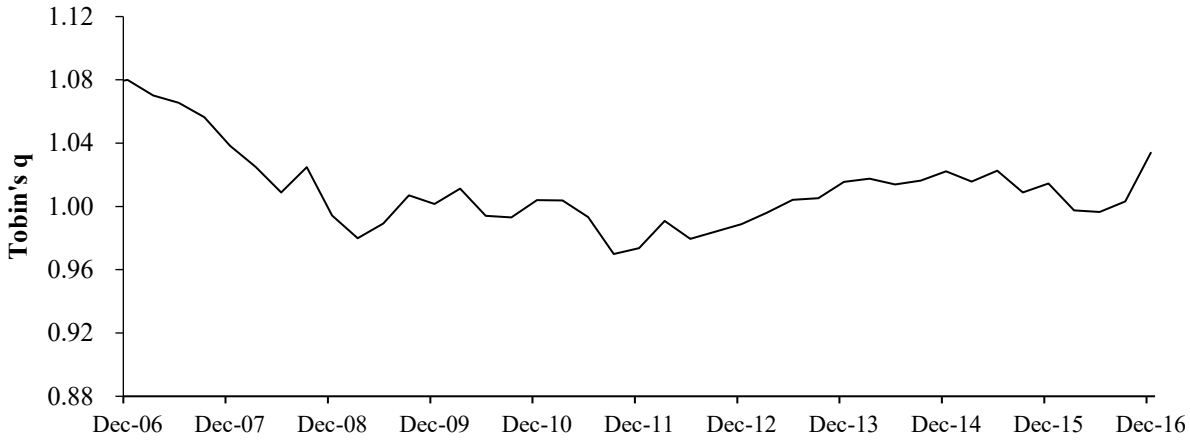


Figure 3 *Sample Tobin's q development over time*



As illustrated in the figures above, the sample-wide variation in the valuation metrics is substantial. The average Tobin's q and market-to-sales ratios declined dramatically from 2006 towards the first half of 2009. Since then, the Tobin's q has remained roughly on a similar level notwithstanding the surge that began in late 2015. Market-to-sales ratios have seen a more dramatical uplift since the 2009's low levels having increased from an average of 1.0x to nearly 3.5x in 2016.

Table 6 reports the initial findings of the diversification discount, when allowing the imputed valuation metrics to vary more substantially. In general, the results suggest the presence of a stronger diversification discount than what was reported in Table 3, which looked at the average discount across the sample by using time-invariant valuations for specialized banks. *Panel A* of Table 6 illustrates that the means and medians of excess value, as measured by either Tobin's q or market-to-sales, are strongly in the negative territory. This is the case with both continuous measures of diversity. The median of Tobin's q-based excess value is -0.104 with the asset diversity measure and -0.077 with the income diversity measure. The results hold in the simple OLS regressions of Tobin's q-based excess value on a constant and either continuous measure of diversification or a diversification dummy. These are strong indications of the presence of an economically significant diversification discount.

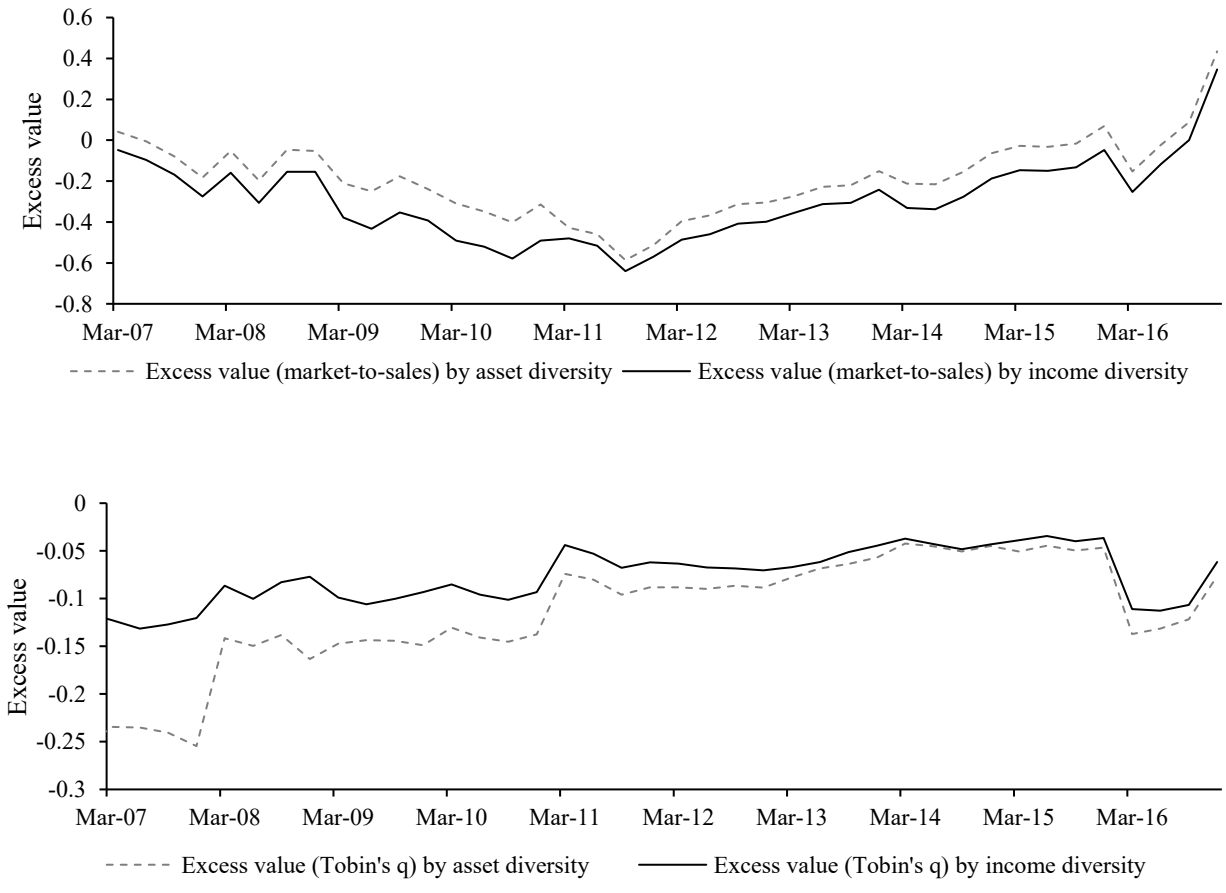
In Panel B that utilizes the market-to-sales valuation metric, the means and medians of the excess continue to stay strongly and statistically significantly in the negative territory. In addition, income diversity (measured with a dummy or with a continuous metric) has a strong inverse relation with the excess value in the OLS setting. However, contradicting these rather uniform and strong findings, when measuring diversity with asset diversity and using

market-to-sales as the valuation metric, the discount turns into a premium of around 18.8%. As described in the summary details, market-to-sales ratio does suffer from a high standard deviation, that raises questions about its validity as a valuation metric. Market-to-sales may also be a problematic metric due to its inability to capture both bank profitability and the extent of bank leverage.

B. The time-varying nature of the diversification discount

Figure 4 below illustrates the development of excess value, as measured by either Tobin's q or market-to-sales, over time. From the graphs, it is evident that the excess values have developed very differently. In fact, the excess value correlation is negative between the metrics of Tobin's q and market-to-sales. However, the four series of excess values have something in common; the value of diversification among banking institutions seems to have increased significantly during the time-period. The figure suggests that diversification is indeed making a comeback. Furthermore, the graphs with Tobin's q as the dependent variable signals that there was an increase in the value of diversification when the financial crisis started to materialize. For market-to-sales metric, this effect is not evident.

Figure 4 *The development of excess value over time*



To study further the average level of the diversification discount and its variance through time and during the financial crisis, a more robust model must be employed. *Table 7* reports the findings of multivariate regressions of Tobin's q-based excess value on diversity measures and several control variables[29]. The first two models (1) and (2) use asset based diversity measures whereas models (3) and (4) use income based measures. The effects of the financial crisis are analysed with two separate measures: crisis period dummies and the VIX. The interaction term between the diversification dummies and the crisis indicators studies whether the value gain or loss from diversification has remained at the same level during different phases of the crisis. The results confirm the existence of an economically significant diversification discount in the sample of U.S. banks. There is also evidence that the value of diversification may have increased as the financial crisis became more pronounced.

As indicated in the table's first row the regression coefficient of *Diversified* is negative and statistically significant in all four regression models. Compared to specialized banks, diversified banks trade between 11.3% and 19.2% discount by the asset diversity measure and between 8.4% and 13.5% discount by the income diversity measure. These coefficients are statistically significant at the 1% level.

The row labelled as *Diversified x VIX* describes the interaction between diversification and the crisis's severity. The regression coefficient is statistically significant and positive by using asset diversity measure, but statistically insignificant with the income measure. The 0.000735 regression coefficient by the asset diversity measure indicates that a 50-point increase in the VIX index is associated with 3.7 percentage point decrease in the diversification discount. This effect is miniscule in comparison with the value effect of 15% by Kuppuswamy and Villalonga (2016). The coefficients of *Diversified x Early*, *Diversified x Crisis-peak* and *Diversified x Post-crisis* are 0.068, 0.096 and 0.133 by the asset measure, respectively. This indicates that compared to the pre-crisis period of 2006Q1 to 2007Q2, the diversification discount decreased by 9.6 percentage points by the crisis-peak and 13.3 percentage points by post-crisis period. For the income measure of diversity, the level of diversification discount has decreased by 7.0 percentage points by the post-crisis period, but the coefficients for early-crisis and crisis-peaks are small and statistically not different from zero. These results indicate that as illustrated in *Figure 4*, the direction of the value from diversification has been up, not likely

[29] In this main regression, I concentrate on Tobin's q rather than market-to-sales. Compared to market-to-sales metric, Tobin's q is more stable, and theoretically more robust, metric of value.

due to changes in the crisis's severity, but following a more general trend. In other words, it seems that diversification among banking institutions does not destroy value as much as it used to before the financial crisis of 2007-2009[30].

To further validate the results, I re-calculate the excess value regression models depicted in *Table 5* by allowing time-variation in the imputed q's and by continuous measures of diversity. *Table 8* reports the results, which seem strongly consistent (and statistically significant) with both measures of diversity and with several model specifications. The level of diversification discount is now between 18.3% to 23.3%, which can is a high level for diversification discount.

To summarize, by using Tobin's q as the basis for constructing the excess values and after introducing time-variant imputed q's following Kuppuswamy and Villalonga (2016), I find both economically and statistically significant diversification discount.

In the next section, I continue with a more extensive discussion of the main findings of this thesis.

[30] In a robustness check, I replicate the analysis of *Table 7* with the continuous measures of diversity. The level of the discount is similar, if not stronger, and the results are statistically significant at 1% level. Furthermore, the models' multicollinearity was examined, and the VIFs of the variables of interest displayed non-material levels of collinearity.

5. Discussion of the results

This section sums up the main findings and limitations. In the first sub-section I contrast the three main hypotheses to the main findings. In the second sub-section, I describe the main limitations of this study.

5.1. Findings and the testable hypotheses

Hypothesis 1: "Conglomeration of activities among U.S. based banks is connected on average to a significantly lower value of these institutions in relation to specialized banks".

After the introduction of time-varying imputed q's and the more robust methods covered in *Section 4.4*, I find a statistically and economically significant diversification discount among U.S. banks when using Tobin's q-based excess value. Firstly, as depicted in Table 6, the mean of this discount ranges from 8.2% to 12.6% and the median from 7.7% to 10.3%. The discount is also evident in a multivariate OLS regression setting (*Table 7*) with both asset and income based measures of diversity and ranges from 8.4% to 19.2% depending on the model specification. In *Table 8*, I confirm these findings be recalculating the earlier multivariate regression models using the time-varying imputed q's. The levels of the discount match the prior research, although within the banking sector focused diversification discount studies, are on the higher side[31]. Then again, the U.S. banking sector has developed much since those days and a new type of a level for the discount is not uncalled for. On the contrary to the summarized findings above, the complementary valuation metric of market-to-sales offers conflicting results on the diversification discount depending on whether asset or income diversity is used. I consider Tobin's q to be the more reliable valuation metric due to its theoretical soundness and relatively low standard deviation, and perceive the hypothesis holds.

Concerning the size of the banks, unlike Schmid and Walter (2009) I do not find any significant deviation in the diversification discount when comparing the largest 'too-big-to-fail' financial institutions with banks of other sizes.

[31] For example, Laeven and Levine (2007) find a discount of around 7% and Kuppuswamy and Villalonga (2016) of around 14% to 17%.

Hence, it seems that the U.S. bank shareholders should favour managerial decisions and strategies that increase bank specialization instead of bank diversity. In practice, this entail concentrating in either investment banking or commercial banking activities.

Hypothesis 2: "During the financial crisis, the average level of the diversification discount decreased significantly."

Figure 4 describes the time-variance of the excess value. The excess value, when measured with asset diversity, does seem to spike around the time of the crisis began to accelerate in 2008. *Table 7* confirms this effect with the statistically significant interaction term between the VIX and the asset diversity-based diversification dummy. However, this effect is economically small and not supported by the model that utilizes the income measure of diversity. Thus, it seems that the findings of Kuppuswamy and Villalonga (2016) regarding the significant decline in the level of the diversification discount during the financial crisis is not evident, or at least not as strong, in the banking sector. Some intuition to the finding is offered by the fact that not all corporate diversification is similar; banks often pursue related instead of unrelated diversification. The authors note: "Since we expect the benefits of internal capital allocation to exceed its costs in the presence of external financing constraints, we expect the effect of the crisis to be greater for conglomerates than for related diversifiers...". Hence, the hypothesis can be rejected, although by noting that there could be some form of an effect.

Hypothesis 3: "After the financial crisis, diversification of activities has been associated with smaller discount than during the run-up to the crisis."

This hypothesis seems to hold up well. Firstly, as illustrated in Figure 4 the sample-wide excess values, no matter how they are measured, have increased since the run-up to the crisis. Secondly, as depicted in Table 7, the interaction term between Diversified x Post-crisis is statistically and economically significant with both diversity measures. For the asset-based measure, the coefficient implies 13.3 percentage point reduction in the diversification discount whereas for the income-based measure, the implied reduction is 7 percentage points. These are high figures considering the discount's likely level. The results offer evidence in support of view that the relationship between diversification and value has changed and diversification is indeed making a comeback.

5.2. Main limitations

Despite some strong results presented above and several actions that pursue to limit potential biasedness, this study continues to have important limitations mainly relating to data and to conflicting results.

The first major limitation of this study is the low number of specialized investment banks in the sample. The initial sample contained no specialized investment banks due to weaknesses in the underlying database of Worldscope. Consequently, the specialized investment banks are collected separately to the sample by using SIC codes. Still, their number remains low. This causes substantial variation in the calculation of the excess value through its effect on the imputed valuation metrics of the banks. This issue is particularly distinct when using market-to-sales to calculate the excess value, resulting in 80% standard deviation in the metric in comparison with 10% for the Tobin's q-based excess value. In addition to the low number of specialized investment banks, the sample is also dominated by lending-focused banks rather than those that favour investment banking activities. This is described by the high average shares of interest income to sales and loans to earning assets. This is unfortunate as the balance of the sample suffers, but on the other hand it describes well the underlying reality of the U.S. banking sector.

Perhaps relatedly, the findings do contain some degree of conflicting elements. The sales-based valuation metric, unlike Tobin's q-based, does not offer conclusive evidence on the existence of a diversification discount. Furthermore, the first parts of the analyses, illustrated in *Tables 3-5*, use a different method in calculating the excess values than the analyses depicted in *Tables 6-8*. The consequence is conflicting results between the sets of analyses. Third source for a conflict in the results, is the wide-ranging levels for the observed diversification discount (8.4% to 19.2%) in the analyses described in *Tables 6* and *7* and 18.3% to 23.3% in *Table 8*. The wide range implies uncertainty over what is the actual level of the discount.

Another limitation that is often present in diversification discount studies concerns Tobin's q. As noted by several researchers including Mansi and Reeb (2002), Glaser and

Müller (2010) and Ammann et al. (2012), the book value of debt does not reflect its market value during a crisis resulting in potential biases in Tobin's q[32].

[32] It is likely that this issue poses no issue for this study since the median ratio of deposits/liabilities is 88%. Hence, the banks seem to be financed in large part through deposits and not bonds that have fluctuating market values.

6. Summary

This study finds evidence that diversified banks that participate in multiple activities are valued lower by the market than if those banks were broken into financial institutions that specialize solely in one activity. The effect of diversity of activities on value is separated from several other effects that could induce an effect on the value of the banks. To improve the robustness of the results, I utilize several metrics of diversity, model specifications and methods. Despite the finding of an average diversification discount, I find significant time-variance in its level. The market has begun to view diversification more positively than before the financial crisis of 2007-2009. As a result, the level of the observed discount has declined, but as of yet, seems not to have turned into a premium. On the other hand, perhaps due to the prevalence of related diversification among banks, I do not find compelling evidence supporting the notion for the insurance value of diversification.

There are several possible explanations for these findings. The vague explanation for the observed discount is that the benefits of diversification are not enough to counter its costs. More specifically, it may be that the economies of scope and benefits an internal capital market are not enough to counter the agency problems nor the inefficient capital allocation in the internal capital market.

The contribution of this study to the existing literature is hence twofold. For one, this study contributes to the existing corporate diversification discount literature by shedding light on the mixed issue on whether there exists a diversification discount among financial conglomerates. This is of a special interest in the U.S. which has only relatively recently seen deregulation allowing the diversification of bank activities. On the theoretical side, despite intuitively strong economies of scope among banks due favourable cross-selling capabilities, the counter-prevailing forces are still too strong to induce a diversification premium. Secondly, I contribute to the rather recent strand of literature which focuses on the time-variance of the discount and on the factors, that seem to affect that variance. To the best of my knowledge, there is no prior study that examines this variance among financial institutions.

For future research, it would be interesting to find out the main factors which affect the discount's variance through time. Furthermore, this analysis would be complemented by adding insurance firms to the sample and by contemporarily studying several markets, including Europe, to gain a more complete picture regarding the diversification discount among financial conglomerates.

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Table 1 *Summary statistics*

The table describes the sample characteristics as well as correlations between main variables. Asset diversity measures the bank's diversification across different types of assets and is calculated as 1-|(Net loans - investments)/(Net loans - investments)|. Income diversity measures the bank's diversification across different types of incomes and is calculated as 1-|(Interest income - noninterest income)/(Sales)|. Both diversity measures are between 0 and 1 and are increasing with diversity. Sample of banks includes all listed U.S. banks (ICB 8300) that had basic financial items available for date 2006Q1 on Worldscope. The sample also includes investment banks that were identified by using SIC codes. I exclude observations lacking basic accounting information for total assets, equity, market value or sales. Data is quarterly from 2006Q1 to 2016Q4.

					Correlations					
Variable	Count	Mean	Median	St. Dev.	Tobin's q	Market to sales	Interest income to sales	Loans to earning assets	Income diversity	Asset diversity
Tobin's q	17,171	1.04	1.01	0.23	1.00					
Market to sales	15,936	2.23	2.03	1.34	0.67	1.00				
Interest income to sales	16,558	0.82	0.83	0.17	-0.01	0.08	1.00			
Loans to earning assets	16,550	0.73	0.75	0.13	-0.02	-0.10	0.27	1.00		
Income diversity	16,324	0.37	0.34	0.20	0.03	-0.06	-0.95	-0.26	1.00	
Asset diversity	16,541	0.52	0.49	0.21	0.07	0.13	-0.21	-0.82	0.22	1.00
Market value	17,171	2,090	92	11,684						
Assets	17,171	21,082	822	130,507						
Equity	17,171	2026	83	12616						
Deposits to liabilities	17,116	0.84	0.88	0.17						
Equity to Assets	17,171	0.11	0.10	0.07						

Table 2 Development of main variable means

Some of the explanatory variables located in the first column are defined in section 3.3. Explanatory variables. Asset diversity measures the bank's diversification across different types of assets and is calculated as 1-|(Net loans - investments)/(Net loans + investments)|. Income diversity measures the bank's diversification across different types of incomes and is calculated as 1-|(Interest income - noninterest income)/(Sales)|. Both diversity measures are between 0 and 1 and are increasing with diversity. Sample of banks includes all listed U.S. banks that had basic financial items available for date 2005Q1 on Worldscope. I exclude observations lacking basic accounting information for total assets, equity, market value or sales. Data is quarterly from 2005Q1 to 2016Q4.

Variable	Whole sample (2006Q1 - 2016Q4)	Crisis run-up (2006Q1 - 2007Q2)	Early crisis (2007Q3 - 2008Q3)	Crisis peak (2008Q4 - 2009Q1)	Post-crisis (2009Q2 - 2016Q4)
Tobin's q	1.04	1.11	1.06	1.01	1.02
Market to sales	2.23	2.42	1.96	1.73	2.28
Interest income to sales	0.82	0.86	0.87	0.87	0.80
Loans to earning assets	0.73	0.75	0.77	0.76	0.72
Income diversity	0.37	0.29	0.30	0.32	0.41
Asset diversity	0.52	0.48	0.45	0.47	0.54
Market value	2,090	2,023	1,468	1,097	2,272
Assets	21,082	14,064	15,328	21,966	23,316
Equity	2,026	1,018	1,064	1,905	2,385
Deposits to liabilities	0.84	0.81	0.79	0.79	0.85
Equity to assets	0.11	0.11	0.11	0.11	0.11

Table 3 Diversity of activities and value using diversification dummies

The first two rows of the table report the regression coefficients on a diversification dummy (either asset or income measure of diversity) from a regression of Tobin's q or excess value on a constant and the diversification dummy. The last two rows of the table report mean and median excess values of the sample. Asset diversity measures the bank's diversification across different types of assets and is calculated as 1-|(Net loans - investments)/(Net loans + investments)|. Income diversity measures the bank's diversification across different types of incomes and is calculated as 1-|(Interest income - noninterest income)/(Sales)|. Income diversity measures the bank's diversification across different types of incomes and is calculated as 1-|(Interest income - noninterest income)/(Sales)|. Both diversity measures are between 0 and 1 and are increasing with diversity. Excess value of a bank is its actual Tobin's q subtracted with its imputed q. The imputed q is the weighted average of specialized commercial and investment banking q's where the weights are based on bank's share of activities as proxied by interest income to sales (income diversity measure) or loans to earning assets (asset diversity measure). Specialized investment banking q's is proxied by the median q's of separate sample of investment banks gathered by using SIC codes. Specialized commercial bank q's are proxied by the median q's of banks with above 0.9 share of interest income to sales (income diversity) or above 0.9 share of loans to earning assets (asset diversity). Diversified bank is a bank that is not part of a separate sample of investment banks and has between 0.1 to 0.9 ratio of interest income to sales or loans to earning assets. Data is quarterly from 2006Q1 to 2016Q4.* significant at 10%; ** significant at 5%; *** significant at 1%. t-statistics are reported in parentheses.

Variable	Asset diversity	Income diversity
Tobin's q (dependent variable in OLS regression)	-0.086***	-0.071***
	(-18.69)	(-16.93)
Excess value (dependent variable in OLS regression)	-0.013***	-0.018***
	(-10.02)	(-15.68)
Excess value average	-0.009***	-0.005***
	(-19.72)	(-10.00)
Excess value median	-0.019***	-0.015***
	(-41.40)	(-32.94)

Table 4 Diversity of activities and value using continuous measures of diversity

The table reports univariate OLS regression coefficients using continuous measures of diversity. The dependent variable used in columns (1) and (2) is the excess value which is the difference of actual Tobin's q and imputed q which is based on either asset diversity or income diversity measure of bank activity. The regression coefficients in columns (1) and (2) are from an OLS regression of excess value on continuous variables of either income diversity or asset diversity. The dependent variable in columns (3) and (4) is the actual Tobin's q. The regressions performed in columns (3) and (4) include an additional bank activity measure as an explanatory variable. Sections 3.2.A and 3.2.B contain definitions of excess values, imputed values and the two diversity measures. All regressions include a constant and the standard errors are clustered at the bank level. Data is quarterly from 2006Q1 to 2016Q4.* significant at 10%; ** significant at 5%; *** significant at 1%. t-statistics are reported in parentheses.

	(1)	(2)	(3)	(4)
	Excess value		Tobin's q	
	Asset diversity	Income diversity	Asset diversity	Income diversity
Income diversity		-0.043***		0.019
		(-4.78)		(1.30)
Interest income to sales				0.049**
				(2.44)
Asset diversity	-0.021**		0.024*	
	(-2.13)		(1.82)	
Loans to earning assets			0.012	
			(0.55)	
Observations	16541	16324	16541	16324
R-Squared	0.0056	0.0217	0.0043	0.0015

Table 5 Diversity and value when controlling for economic and bank specific factors

The table contains multivariate OLS regression results of excess value or Tobin's q on diversity measures and a set of control variables. The dependent variable used in columns (1) to (4) is the excess value which is the difference of actual Tobin's q and imputed q which is based on either income diversity (Panel A) or asset diversity (Panel B). The dependent variable in columns (5) to (8) is the actual Tobin's q. Sections 3.2.A and 3.2.B contain definitions of excess values, imputed values and the two diversity measures. Log (assets) is the natural logarithm of the bank's total assets. Deposits to liabilities is the ratio between total deposits to total liabilities. Equity to assets is the ratio of shareholder's equity to total assets. Market share of deposits is the bank's deposits' share of all deposits in a given quarter. Risk free rate is the U.S. 10-year treasury rate. GDP growth is the annualized growth rate of the U.S. real GDP per capita. Inflation is the annualized change in the U.S. CPI. VIX is the level of the CBOE volatility index. All items are measured at calendar quarter-ends. All regressions include a constant and the standard errors are clustered at the bank level. Data is quarterly from 2006Q1 to 2016Q4.* significant at 10%; ** significant at 5%; *** significant at 1%. t-statistics are reported in parentheses.

Panel A: Income Diversity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Excess value	Excess value	Excess value	Excess value	Tobin's q	Tobin's q	Tobin's q	Tobin's q
Log (assets)	0.00946***	0.0117***	0.0112***	0.0110***	0.00931***	0.0115***	0.0111***	0.0109***
	(6.21)	(7.22)	(6.84)	(6.80)	(6.10)	(7.13)	(6.77)	(6.71)
Income diversity	-0.0657***	-0.0452***	-0.0419***	-0.0453***	-0.0161	-0.00321	-0.00116	-0.00343
	(-7.67)	(-5.16)	(-4.72)	(-5.11)	(-1.28)	(-0.26)	(-0.10)	(-0.29)
Interest income to sales					0.0241	0.00983	0.00733	0.00946
					(1.48)	(0.65)	(0.49)	(0.62)
Deposits to liabilities	-0.00452	0.0481**	0.0472**	0.0358	-0.00754	0.0453**	0.0445*	0.0330
	(-0.19)	(2.09)	(1.97)	(1.48)	(-0.32)	(1.98)	(1.87)	(1.37)
Equity to assets	-0.0734	-0.0275	-0.0359	-0.0443	-0.0718	-0.0262	-0.0348	-0.0431
	(-0.78)	(-0.27)	(-0.35)	(-0.44)	(-0.77)	(-0.26)	(-0.34)	(-0.43)
Market share of deposits	-0.464***	-0.540***	-0.520***	-0.524***	-0.470***	-0.545***	-0.525***	-0.529***
	(-4.36)	(-5.22)	(-5.04)	(-5.00)	(-4.44)	(-5.28)	(-5.10)	(-5.06)
Risk free rate		0.0204***	0.0185***	0.0169***		0.0204***	0.0184***	0.0168***
		(19.96)	(19.14)	(16.48)		(19.90)	(19.08)	(16.40)
GDP growth			0.000755***	-0.000734***			0.000768***	-0.000726***
			(3.74)	(-5.51)			(3.81)	(-5.45)
Inflation			0.0260***	0.0222***			0.0260***	0.0222***
			(23.62)	(22.10)			(23.55)	(22.02)
VIX				-0.00105***				-0.00106***
				(-13.79)				(-13.84)
Observations	16310	16310	15660	15660	16310	16310	15660	15660
Adj. R-squared	0.065	0.183	0.231	0.248	0.045	0.165	0.213	0.231

Panel B: Asset Diversity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Excess value	Excess value	Excess value	Excess value	Tobin's q	Tobin's q	Tobin's q	Tobin's q
Log (assets)	0.00806***	0.0115***	0.0112***	0.0109***	0.00774***	0.0112***	0.0109***	0.0106***
	(5.43)	(7.36)	(7.13)	(6.97)	(5.26)	(7.24)	(7.01)	(6.83)
Asset diversity	-0.0218**	-0.00918	-0.00377	-0.00604	0.0185	0.0157	0.0208*	0.0214**
	(-2.39)	(-1.04)	(-0.42)	(-0.67)	(1.45)	(1.45)	(1.96)	(2.00)
Loans to earning assets					0.00501	-0.0243	-0.0249	-0.0191
					(0.24)	(-1.37)	(-1.47)	(-1.11)
Deposits to liabilities	-0.00170	0.0601***	0.0614**	0.0501**	-0.0151	0.0510**	0.0521**	0.0395*
	(-0.07)	(2.61)	(2.59)	(2.07)	(-0.66)	(2.27)	(2.25)	(1.68)
Equity to assets	-0.0640	-0.0268	-0.0373	-0.0436	-0.0575	-0.0231	-0.0337	-0.0397
	(-0.70)	(-0.28)	(-0.39)	(-0.47)	(-0.62)	(-0.24)	(-0.35)	(-0.42)
Market share of deposits	-0.552***	-0.632***	-0.614***	-0.617***	-0.510***	-0.605***	-0.587***	-0.587***
	(-5.12)	(-6.02)	(-5.83)	(-5.79)	(-4.81)	(-5.75)	(-5.58)	(-5.53)
Risk free rate		0.0217***	0.0197***	0.0182***		0.0215***	0.0194***	0.0179***
		(21.20)	(20.33)	(17.59)		(20.83)	(20.04)	(17.34)
GDP growth			0.000459**	-0.000923***			0.000518**	-0.000888***
			(2.12)	(-6.43)			(2.43)	(-6.23)
Inflation			0.0270***	0.0235***			0.0270***	0.0234***
			(25.26)	(23.68)			(25.07)	(23.23)
VIX				-0.000972***				-0.000993***
				(-12.60)				(-13.14)
Observations	16534	16534	15882	15882	16534	16534	15882	15882
Adj. R-squared	0.044	0.182	0.235	0.249	0.041	0.176	0.231	0.246

Table 6 Excess value of diversified banks allowing for time-variant imputed q's

The table reports the average and median values of Tobin's q-based and market-to-sales-based excess value and univariate OLS regression results of excess value on a measure of diversity and a constant. Diversity is measures with either asset or income based measure and either continuously or with a diversification dummy. Sections 3.2.A and 3.2.B contain definitions of excess values, imputed values and the two diversity measures. The excess values allow for the time-variation in the specialized bank valuation when calculating imputed values of diversified banks. Data is quarterly from 2006Q1 to 2016Q4. * significant at 10%; ** significant at 5%; *** significant at 1%. t-statistics are reported in parentheses.

Variable	Asset diversity (continuous)	Asset diversity (dummy)	Income diversity (continuous)	Income diversity (dummy)
Panel A: Tobin's q measure of value				
Excess value average	-0.1264***		-0.08230***	
	(-147.07)		(-73.59)	
Excess value median	-0.1037***		-0.07745***	
	(-120.63)		(-69.26)	
Regression: excess value	-0.1830***	-0.06887***	-0.1625***	-0.07806***
	(-46.46)	(-28.46)	(-51.23)	(-28.34)
Panel B: Market-to-sales as measure of value				
Excess value average	-0.1895***		-0.3009***	
	(-30.91)		(-48.43)	
Excess value median	-0.08576***		-0.1932***	
	(-13.99)		(-31.11)	
Regression: excess value	0.1875***	-0.01279	-0.3627***	-0.1787***
	(6.47)	(-0.73)	(-11.71)	(-11.40)

Table 7 Diversification discount in time with time-variant imputed q's

The table reports multivariate OLS regressions results of Tobin's q-based excess value on diversity measures and a set of control variables. The first two models (1) and (2) use asset based diversity measures whereas models (3) and (4) use income based measures. Sections 3.2 and 3.3 cover the excess value, diversity measures and control variables. Models (1) and (3) use dummies characterizing different time-periods whereas (2) and (4) use VIX as a continuous measure of the crisis. The crisis period dummies are: early crisis (2007Q3–2008Q3), crisis-peak (2008Q4–2009Q1), post-crisis (2009Q2–2016Q4) and pre-crisis period serves as the default category. The excess values allow for the time-variation in the specialized bank valuation when calculating imputed values of diversified banks. All regressions include a constant, and the standard errors are clustered at the bank level. Data is quarterly from 2006Q1 to 2016Q4. * significant at 10%; ** significant at 5%; *** significant at 1%. t-statistics are reported in parentheses.

	Asset diversity		Income diversity	
	(1)	(2)	(3)	(4)
	Crisis period dummies	VIX	Crisis period dummies	VIX
Diversified	-0.192***	-0.113***	-0.135***	-0.0838***
	(-18.95)	(-14.89)	(-9.99)	(-6.44)
Early crisis	0.00649		0.0290	
	(1.04)		(1.27)	
Crisis-peak	0.00188		0.0373	
	(0.22)		(1.33)	
Post-crisis	0.0337***		0.0193	
	(3.71)		(1.55)	
Diversified x Early crisis	0.0682***		-0.000586	
	(9.60)		(-0.03)	
Diversified x Crisis-peak	0.0958***		0.00250	
	(9.99)		(0.08)	
Diversified x Post-crisis	0.133***		0.0704***	
	(12.43)		(5.49)	
VIX		-0.00151***		-0.000244
		(-6.45)		(-0.45)
Diversified x VIX		0.000735***		-0.000460
		(3.14)		(-0.80)
Log (assets)	0.0166***	0.0175***	0.00587**	0.00598**
	(7.57)	(8.01)	(2.39)	(2.47)
Deposits to liabilities	0.206***	0.226***	0.0873***	0.0956***
	(3.94)	(4.32)	(2.77)	(3.02)
Equity to assets	-0.182**	-0.195**	-0.000585	-0.00260
	(-2.08)	(-2.31)	(-0.00)	(-0.02)
Market share of deposits	-1.131***	-1.147***	-0.743***	-0.735***
	(-5.45)	(-5.53)	(-5.07)	(-4.92)
Risk free rate	-0.0112***	-0.0449***	-0.00565***	-0.0231***
	(-7.40)	(-23.90)	(-3.21)	(-14.22)
GDP growth	-0.000303	0.000595**	-0.00103*	-0.000527
	(-1.41)	(2.46)	(-1.85)	(-0.98)
Inflation	0.0143***	-0.0326***	0.0101***	-0.0139***
	(6.96)	(-16.80)	(3.65)	(-6.76)
Constant	-0.346***	-0.111*	-0.151***	-0.0296
	(-6.23)	(-1.94)	(-4.28)	(-0.75)
Observations	15890	15890	15890	15890
Adj. R-squared	0.458	0.397	0.105	0.092

Table 8 Diversity and value when controlling for economic and bank specific factors and using time-variant imputed q's

The table contains multivariate OLS regression results of excess value on diversity measures and a set of control variables. Models (1) to (4) use continuous income diversity measure and models (5) to (8) use continuous asset diversity measure. Log (assets) is the natural logarithm of the bank's total assets. Sections 3.2.A and 3.2.B contain definitions of excess values, imputed values and the two diversity measures. Deposits to liabilities is the ratio between total deposits to total liabilities. Equity to assets is the ratio of shareholder's equity to total assets. Market share of deposits is the bank's deposits' share of all deposits in each quarter. Risk free rate is the U.S. 10-year treasury rate. GDP growth is the annualized growth rate of the U.S. real GDP per capita. Inflation is the annualized change in the U.S. CPI. VIX is the level of the CBOE volatility index. All items are measured at calendar quarter-ends. All regressions include a constant and the standard errors are clustered at the bank level. Data is quarterly from 2006Q1 to 2016Q4. * significant at 10%; ** significant at 5%; *** significant at 1%. t-statistics are reported in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Income diversity	Income diversity	Income diversity	Income diversity	Asset diversity	Asset diversity	Asset diversity	Asset diversity
Log (assets)	0.0145***	0.0114***	0.0114***	0.0113***	0.0232***	0.0157***	0.0158***	0.0155***
	(7.05)	(6.31)	(6.22)	(6.20)	(10.23)	(7.46)	(7.26)	(7.08)
Diversity	-0.197***	-0.226***	-0.230***	-0.233***	-0.183***	-0.211***	-0.219***	-0.221***
	(-16.83)	(-21.07)	(-20.88)	(-21.39)	(-15.57)	(-19.35)	(-19.61)	(-19.63)
Deposits to liabilities	0.168***	0.0930***	0.0868***	0.0762***	0.363***	0.226***	0.220***	0.208***
	(5.93)	(3.61)	(3.23)	(2.81)	(7.49)	(4.12)	(3.82)	(3.53)
Equity to assets	0.0440	-0.0216	-0.0215	-0.0292	-0.0400	-0.122	-0.120	-0.126
	(0.29)	(-0.16)	(-0.16)	(-0.22)	(-0.38)	(-1.39)	(-1.33)	(-1.42)
Market share of deposits	-0.610***	-0.500***	-0.495***	-0.499***	-1.011***	-0.834***	-0.824***	-0.827***
	(-4.65)	(-3.93)	(-3.84)	(-3.82)	(-4.76)	(-3.73)	(-3.66)	(-3.63)
Risk free rate		-0.0291***	-0.0283***	-0.0297***		-0.0480***	-0.0459***	-0.0473***
		(-19.85)	(-20.20)	(-20.14)		(-25.39)	(-25.96)	(-25.08)
GDP growth			0.00223***	0.000854***			0.00236***	0.000937***
			(9.03)	(4.55)			(6.79)	(3.90)
Inflation			-0.0139***	-0.0174***			-0.0300***	-0.0336***
			(-9.16)	(-11.64)			(-16.49)	(-17.99)
VIX				-0.000977***				-0.00100***
				(-10.10)				(-8.08)
Observations	16310	16310	15660	15660	16534	16534	15882	15882
Adj. R-squared	0.204	0.313	0.329	0.336	0.260	0.436	0.465	0.469